onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

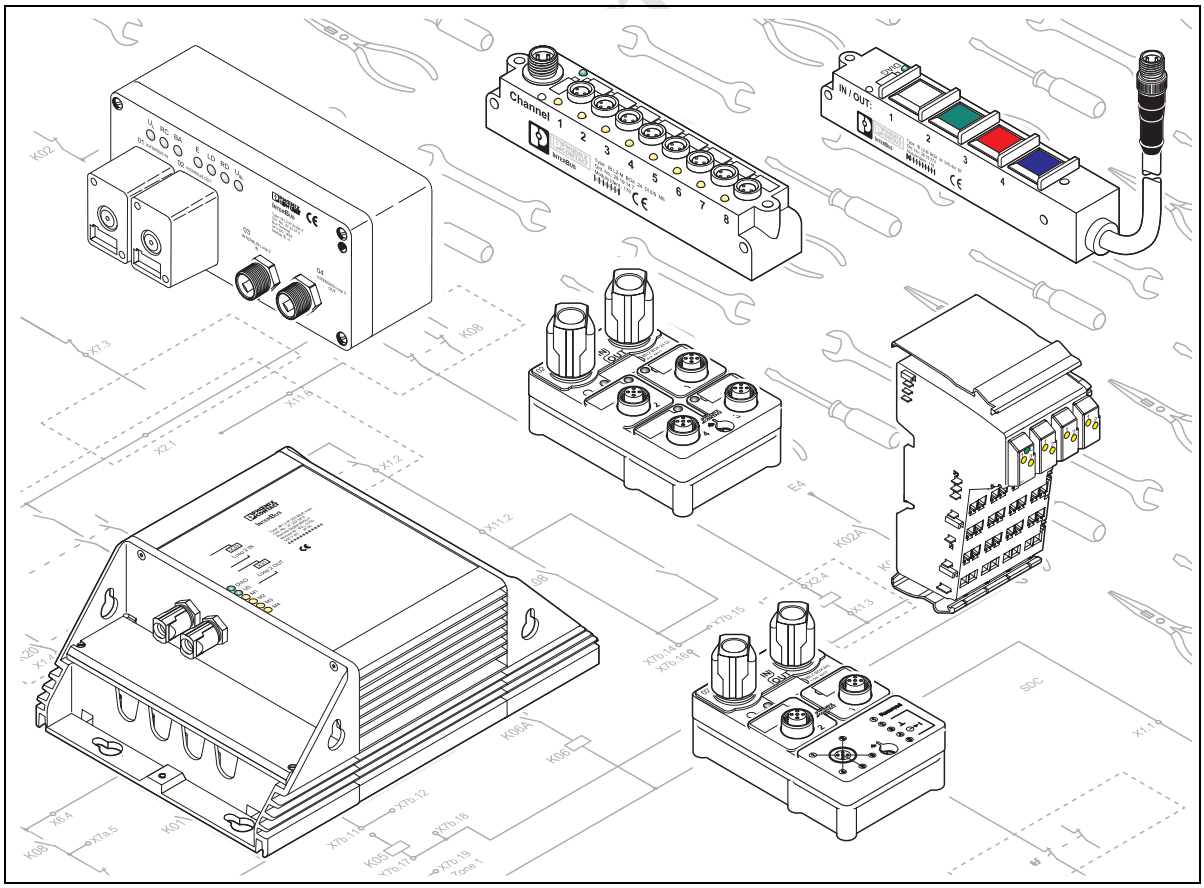
PHOENIX CONTACT
INSPIRING INNOVATIONS

User Manual

Configuring and Installing the INTERBUS Loop 2 and INTERBUS S-Line Product Range

Designation: IB L2 SYS PRO UM E

Order No.: 27 43 49 1



onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Configuring and Installing the INTERBUS Loop 2 and INTERBUS S-Line Product Range

Designation: IB L2 SYS PRO UM E

Revision: C

Order No.: 27 43 49 1

This manual is valid for:
Modules of the INTERBUS Loop 2 and INTERBUS S-Line product range

onlinecomponents.com

© PHOENIX CONTACT 08/2002

5796C

PHOENIX CONTACT

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Please Observe the Following Notes:

In order to guarantee the safe use of your device, we recommend that you read this manual carefully. The following notes give you information on how to use this manual.

Requirements of the User Group

The use of products described in this manual is oriented exclusively to qualified electricians or persons instructed by them, who are familiar with applicable national standards. Phoenix Contact assumes no liability for erroneous handling or damage to products from Phoenix Contact or external products resulting from disregard of information contained in this manual.

Explanation of Symbols Used

The *attention* symbol refers to an operating procedure which, if not carefully followed, could result in damage to equipment or personal injury.

The *note* symbol informs you of conditions that must strictly be observed to achieve error-free operation. It also gives you tips and advice on hardware and software optimization to save you extra work.

The *text* symbol refers to detailed sources of information (manuals, data sheets, literature, etc.) on the subject matter, product, etc. This text also provides helpful information for the orientation in the manual.

We Are Interested in Your Opinion

We are constantly attempting to improve the quality of our manuals.

Should you have any suggestions or recommendations for improvement of the contents and layout of our manuals, we would appreciate it if you would send us your comments. Please use the universal fax coupon at the back of the manual for this.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Statement of Legal Authority

This manual, including all illustrations contained herein, is copyright protected. Use of this manual by any third party in departure from the copyright provision is forbidden. Reproduction, translation, or electronic or photographic archiving or alteration requires the express written consent of Phoenix Contact. Violations are liable for damages.

Phoenix Contact reserves the right to make any technical changes that serve the purpose of technical progress.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

About This Manual

Purpose of this manual

This manual illustrates how to configure a Loop 2 system to meet your application requirements.

Who should use this manual

Use this manual if you are responsible for configuring and installing a Loop 2 system within INTERBUS. This manual is written based on the assumption that the reader possesses basic INTERBUS knowledge.

Related documentation

For additional information regarding INTERBUS in general, refer to the "General Introduction to the INTERBUS System" User Manual.

The manual mentioned above may be ordered directly from Phoenix Contact.

Description	Order Designation	Order No.
General Introduction to the INTERBUS System	IBS SYS INTRO G4 UM E	27 45 21 1

Current documentation on the Internet

Make sure you are always working with the latest documentation published. Changes in or additional information on present documentation can be found on the Internet at www.phoenixcontact.com. The Phoenix Contact homepage is updated daily.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Orientation in this manual

For easy orientation when looking for specific information the manual offers the following help:

- The manual starts with the main table of contents that gives you an overview of all manual topics.
- Each manual section starts with an overview of the section topics.
- On the left side of the pages within the sections you will see the topics that are covered in the section.
- In the appendix you will find a list of figures and a list of tables. The index helps you find the term you are looking for.
- At the end of this manual you will find explanations of typical INTERBUS terms and abbreviations used in this manual.

This user manual includes

The first section of this manual introduces you to the Loop 2 basics.

The following sections contain general information that applies to all modules or module groups of the INTERBUS Loop 2 and INTERBUS S-Line product range. Topics are, for example:

- Overview of the product groups
- Structure of the modules
- Module installation and connection
- Troubleshooting and debugging
- Common technical data

If you need specific information on a module refer to the module-specific data sheets.

Validity of documentation

This manual contains a description of the modules that were available when the manual was published.

Phoenix Contact reserves the right to make any technical extensions and changes to the system that serve the purpose of technical progress. Up to the time that a new manual revision is published, any updates or changes will be documented on the Internet at www.phoenixcontact.com.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table of Contents

1 Integration of Loop 2 Into the INTERBUS System 1-3

1.1 The INTERBUS System 1-3

1.2 The INTERBUS Installation System as the Basis of the INTERBUS System 1-9

1.3 INTERBUS S-Line as Part of the INTERBUS Loop System 1-17

2 Product Groups 2-3

2.1 Loop 2 Bus Terminal Module 2-3

2.2 Loop 2 Branch Terminal 2-6

2.3 Digital Loop 2 Devices 2-7

2.4 Analog Loop 2 Devices 2-9

2.5 Loop 2 Motor Starter 2-12

2.6 Loop 2 Power Module 2-14

2.7 INTERBUS S-Line 2-15

3 Description of the Modules 3-3

3.1 Structure of the modules 3-3

3.2 Dimensions of the Modules 3-8

3.3 Labeling of I/O Modules 3-16

3.4 Diagnostic and Status Indicators 3-17

4 Mounting and Connecting Modules 4-3

4.1 General Information on INTERBUS Installation 4-3

4.2 Loop 2 Installation 4-8

4.3 Mounting Loop 2 Modules 4-13

4.4 Connecting Cables 4-15

4.5 Shielding of Analog Sensors and Actuators 4-31

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.6 Connecting Loop 2 Motor Starter 4-35
4.7 Mounting and Connecting S-Line Modules 4-42
4.8 Initial Startup 4-48
4.9 Measuring Voltage Drop 4-51
4.10 Connecting Sensors and Actuators 4-54

5 Error Localization and Removal 5-3
5.1 General Information on Localization of an Error 5-3
5.2 Failure of the Loop Supply 5-4

6 Technical Data 6-3
6.1 System Data 6-3
6.2 Technical Data 6-7
6.3 Technical Data of the Cable Types 6-14

7 Ordering Data 7-3
7.1 Ordering Data for Loop 2 Modules 7-3
7.2 Ordering Data for Loop 2 Accessories 7-4
7.3 Ordering Data for S-Line Modules 7-5
7.4 Ordering Data S-Line Accessories 7-5
7.5 Ordering Data for Documentation 7-10

A List of Devices of an INTERBUS Loop 2 System A-1
A 1 Loop 2 Device List A-2
A 2 S-Line Module Device List A-4

B Lists B-1
B 1 List of Figures B-1

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 1

This section informs you about

– the INTERBUS system
– the INTERBUS installation system
– the INTERBUS Loop 2 product range
– the INTERBUS S-Line product range

Integration of Loop 2 Into the INTERBUS System 1-3

1.1 The INTERBUS System 1-3
1.1.1 Example Topology of an INTERBUS System 1-4
1.2 The INTERBUS Installation System as the Basis of the INTERBUS System 1-9
1.2.1 Product Ranges of the Installation System 1-9
1.2.2 Features of the Installation System 1-10
1.2.3 Loop 2 as a Component of the INTERBUS Installation System 1-12
1.2.4 Loop 2 Product Description 1-14
1.2.5 System Specifications 1-16
1.3 INTERBUS S-Line as Part of the INTERBUS Loop System 1-17
1.3.1 S-Line Product Description 1-18
1.3.2 S-Line Example Topology 1-19

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1 Integration of Loop 2 Into the INTERBUS System

1.1 The INTERBUS System

INTERBUS is a serial bus system, which transmits data between control systems (e.g., PCs, PLCs, VMEbus computers, robot controllers etc.) and spatially distributed I/O modules that are connected to sensors and actuators (e.g., temperature sensors, position switches).

Forward and return line in one cable

From the controller board, all devices are connected to the bus system. Each device has two separate lines for data transmission: one for forward data transfer and one for return data transfer. This eliminates the need for a return line from the last to the first device, necessary in a simple ring system. The forward and return lines run in one bus cable. From the installation point of view, INTERBUS has a tree structure as only one cable leads from one device to the next.

In the INTERBUS topology the single bus devices can be differentiated by means of their position in the system. There are controller boards, bus terminal modules, remote bus devices, installation remote bus devices and local bus devices.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.1.1 Example Topology of an INTERBUS System

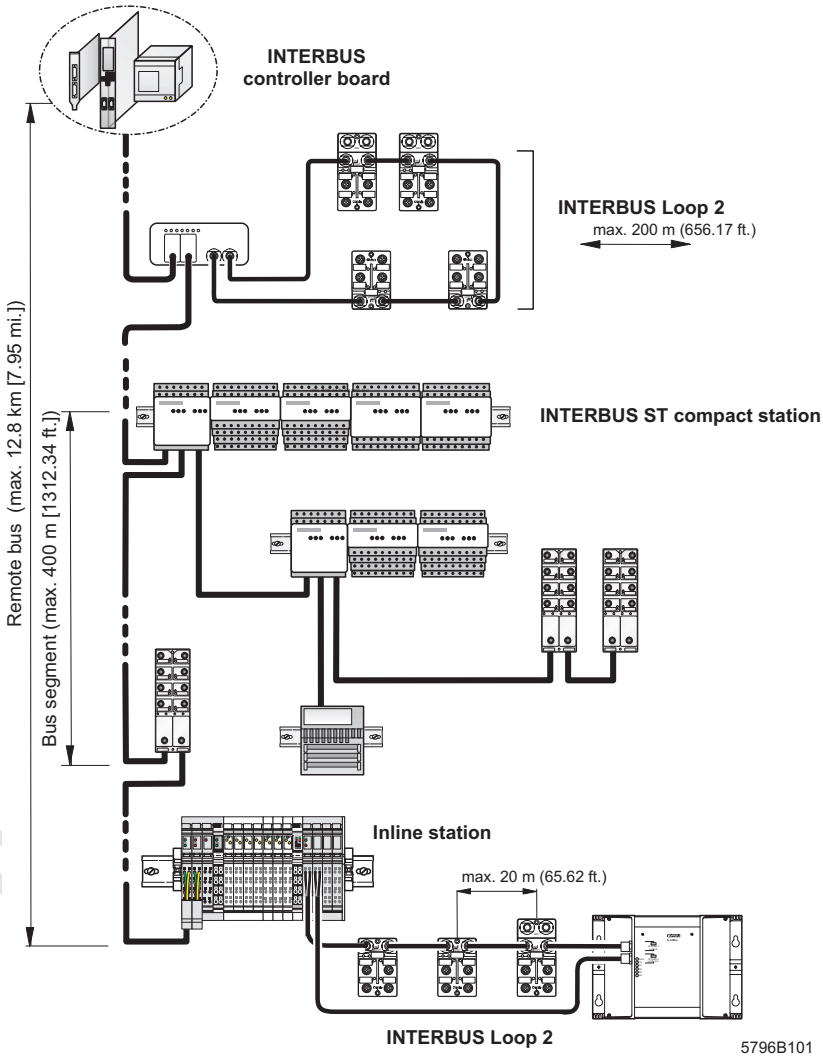


Figure 1-1 Example topology of the INTERBUS system

Controller board

The controller board takes over the master function in the INTERBUS network. It organizes the data traffic in the INTERBUS system, independent of the control or computer system in which it is installed.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Controller boards are available for a wide range of control and computer systems. These are listed in the "INTERBUS Addressing" Data Sheet (DB GB IBS SYS ADDRESS, Part No. 90 00 99 0)

Tasks of the controller board:

– Transmitting output data to the output modules
– Reading the input data from the input modules
– Monitoring INTERBUS
– Sending error messages to the host system
– Indicating diagnostic messages
– Controlling the cyclic I/O protocol

Bus terminal module

The first step in setting up a modular system is to connect the bus terminal module to the INTERBUS remote bus cable. I/O modules (or also power modules and function modules) may be installed branching off from this bus terminal module, to create a local bus.

A bus terminal module divides the system into segments, thus allowing you to switch off single branches during operation. In addition, the bus terminal module supplies communications voltage to the module electronics of the connected modules.

A bus terminal module must be supplied with non-interruptible voltage. This means that the voltage may not be off at the same time as the subsystem if the whole bus system is to continue operation. A failure of the supply voltage on the bus terminal module stops the system and causes an error message for the bus segment.

Tasks of the bus terminal module:

– Coupling the remote bus and local bus
– Supplying the modules with communications voltage
– Updating the data signal (repeater function)
– Electrical isolation of the bus segments
– Connecting or disconnecting the local bus and the outgoing remote bus via firmware
– If required, reporting errors via an electrically isolated alarm output (e.g., sound signal, light signal)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Remote bus

The remote bus connects the controller board with the remote bus devices and the remote bus devices with each other.

Remote bus devices are bus terminal modules, certain modules or a mixture of both. Each has a local voltage supply and an electrically isolated outgoing INTERBUS segment.

The maximum number of remote bus devices on INTERBUS is limited to 254.

Installation remote bus

In addition to the data transmission lines, the remote bus can also carry the voltage supply line for the connected devices, the sensors and analog actuators. This network cabling is referred to as installation remote bus.

Local bus

A local bus is a bus connection that branches off from a remote bus via a bus terminal module and connects the local bus devices with each other. The bus terminal supplies the connected devices with communications voltage. The switching voltage for the outputs must be connected separately to the output modules.

Local bus devices are I/O devices used to set up a decentralized substation in the control cabinet or in the field. The devices are connected to the remote bus via a bus terminal module. Within the local bus, branching is not allowed.

The maximum number of local bus devices depends on the bus terminal module used.

Installation local bus

The installation local bus connects INTERBUS Loop devices or INTERBUS Loop 2 devices.

The installation local bus is used to network distributed sensors and actuators on machines or in systems. Individual I/O devices with corresponding module electronics can also be connected to the installation local bus (Loop or Loop 2).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

INTERBUS Loop

INTERBUS Loop (Loop) is connected to the remote bus using a bus terminal module. The bus terminal module converts the signals from the remote bus to the installation local bus and provides the supply voltage for the Loop. Up to 32 Loop devices can be connected to a bus terminal module using a two-wire twisted unshielded cable which transfers data and supplies power to the connected devices.

In a Loop system Loop 2 modules can only be used with firmware version 4.4x or later.

For additional information on INTERBUS Loop, please refer to the "Configuring and Installing the INTERBUS Loop Product Range" User Manual (IB SL SYS PRO UM E) on the Internet at www.phoenixcontact.com.

INTERBUS Loop 2

INTERBUS Loop 2 (Loop 2) is a further development of INTERBUS Loop. It features extended technical parameters and more extensive diagnostics.

With Loop 2 up to 63 INTERBUS Loop 2 devices can be connected to a bus terminal module using a two-wire twisted unshielded cable which transfers data and supplies power to the connected devices.

In the same way as INTERBUS Loop, Loop 2 topologically represents an installation local bus. The installation local bus is integrated into an INTERBUS remote bus via a bus terminal module or into an Inline station via a local bus branch terminal.

Loop modules are not to be used in a Loop 2 system.

INTERBUS Inline

INTERBUS Loop 2 and INTERBUS Inline are the basis of the Phoenix Contact INTERBUS installation system.

Only Loop 2 can be integrated into an Inline station. Loop 2 is connected using a local bus branch terminal (Loop 2 branch terminal).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

The bus terminal module (in the remote bus) or the branch terminal (within the Inline station) converts INTERBUS signals to the bus physics of Loop 2 and provides the supply voltage. For general technical data about INTERBUS Inline please refer to Section 6.1.3, "INTERBUS Inline System Data".

For additional information on the Inline product range, please refer to the "Configuring and Installing the INTERBUS Inline Product Range" User Manual (IBS IL SYS PRO UM E, Order No. 27 43 04 8).

Remote bus branch

A remote bus branch is a branch off the remote bus. A branch is connected to the main line of the remote bus via a special bus terminal module. This bus terminal module allows the connection and disconnection of the branching bus segment.

Bus segment

A bus segment consists of a remote bus device and the I/O modules connected to it. The preceding cable is also part of the segment.

I/O modules

I/O modules connect INTERBUS to the sensors and actuators.

For additional information on the INTERBUS topology, please refer to the "General Introduction to the INTERBUS System" User Manual (IBS SYS INTRO G4 UM E, Order No. 27 45 21 1).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.2 The INTERBUS Installation System as the Basis of the INTERBUS System

The INTERBUS installation system offers mechanical engineers and system builders an automation system with decentralized control. The INTERBUS system has the standard functions required to meet the needs of virtually any automation system. INTERBUS Inline and INTERBUS Loop 2 from Phoenix Contact are the basis for the INTERBUS installation system.

Definition

The installation system consists of standardized functions, uniform interfaces, and easy connections.

1.2.1 Product Ranges of the Installation System

INTERBUS Inline

The INTERBUS Inline product range is a modular automation system that is integrated into the INTERBUS system. With Inline automation terminals you can easily add one terminal to the next and build functional units that meet your automation requirements. These functional units make the classical and module-oriented control cabinet redundant.

The Inline system contains automation terminals for all standard functions, like digital and analog input and output, control, pneumatics, safety, hydraulics and motor starters.

INTERBUS Loop 2

INTERBUS Loop 2 can be directly connected to the INTERBUS remote bus using a bus terminal module or to an Inline station using a Loop 2 branch terminal. In this way, the sensors and actuators in the field are networked with the Inline station in the control box.

The individual input and output modules with IP 65/IP 67 protection are connected using a two-wire twisted unshielded Loop cable. The modules are connected to the bus using the QUICKON connection method. Sensors and actuators are connected via M12 connectors.

Modules with digital and analog inputs and outputs and motor starters are available within the Loop 2 product range (see "Versions"on page 1-14).

INTERBUS S-Line

INTERBUS S-Line is based on the INTERBUS Loop 2 functionality. It has been especially developed for use on small and mid-sized machines. In order to place I/O modules as close as possible to sensors and actuators a new cabling system has been designed for meeting the requirements of

online components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

mechanical engineering. Preassembled and tested cables with M12 circular connectors are used as S-Line bus cables. Sensors and actuators are connected to input and output modules (with IP 65/IP 67 protection) using M8 connectors.

1.2.2 Features of the Installation System

Standardized functions

The basic idea of the installation system is distributing the inputs and outputs in the field and creating function blocks in order to optimize the application. After the I/O points have been decentralized, the required standardized functions can now be created. The individual function blocks that are created with INTERBUS Inline can be installed in terminal boxes directly in the field. A control component (distributed intelligence, e.g., Inline controller) can be integrated in the function blocks. This makes it possible to combine machines and systems modularly in small groups. That means, the central control system is divided into small distributed units in the machine or the system. Apart from the control component, special function modules, pneumatic modules, safety modules, power modules, hydraulic modules, etc. can be integrated into the Inline station. All functions move from the control cabinet directly into the field.

Signals of modular machine and system parts close to the Inline station can be processed in the distributed control system with INTERBUS Loop 2. Loop 2 can be integrated into the Inline station via a Loop 2 branch terminal.

Seamless bus

The INTERBUS installation system features a seamless communication from the sensor to the control system via INTERBUS. Neither INTERBUS Inline nor INTERBUS Loop 2 require a gateway or link solution.

Every Loop 2 device is an INTERBUS network device and contains a separate INTERBUS Loop 2 protocol chip (LPC2). Every Inline automation terminal also is an INTERBUS network device with a separate INTERBUS protocol chip (SUPI III OPC).

You need just one configuration and startup software package for the entire installation system, e.g., CMD for standard controller boards or PC WORX when using a Field Controller (e.g., Inline controller).

Easy connection

Connecting the individual components of the installation system can be described in three words: "Automation without wiring".

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

With INTERBUS Inline the complex wiring of individual terminal points that was necessary in control cabinets is replaced by simply connecting the Inline automation terminals together. When an Inline station is installed correctly, I/O power and data circuits are automatically created.

The INTERBUS Inline I/O devices are connected using COMBICON connectors with spring-clamp terminals. The connectors can be encoded in such a way that they cannot be mixed up. If an automation terminal has to be exchanged the wiring does not need to be removed. Just remove the connector from the terminal.

The easy QUICKON connection method ensures quick interconnection of Loop 2 modules with IP 65/IP 67 protection.

The I/O devices are connected to the Loop 2 modules using M12 connectors.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.2.3 Loop 2 as a Component of the INTERBUS Installation System

INTERBUS Loop 2 enables the direct connection of sensors and actuators in an environment close to the station. Loop 2 is connected to an Inline station using the Loop 2 branch terminal.

Modules with digital and analog inputs and outputs, a temperature measurement module and a motor starter are available within the Loop 2 product range.

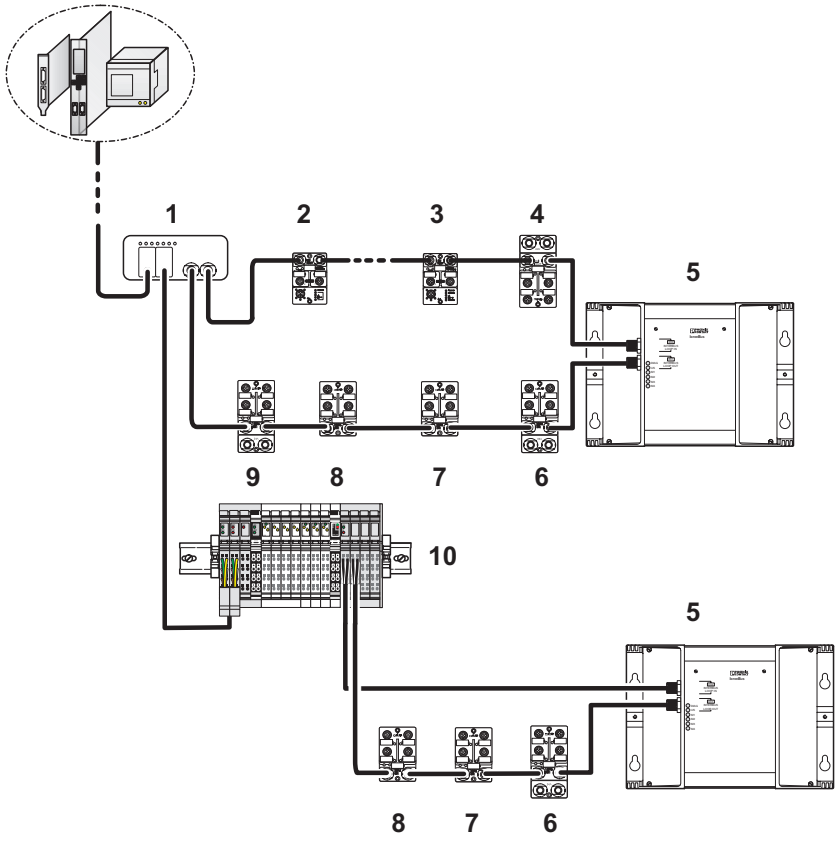


Figure 1-2 Schematic structure example of a Loop 2 system

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Figure 1-2 shows Loop 2 modules for different tasks within a system.

Key:

1 Loop 2 bus terminal module
2 Analog output module with one output
3 Analog input module with two inputs
4 Loop 2 module with four digital inputs
5 Loop 2 motor starter
6 Digital input and output module, each with two channels
7 Digital input module with four inputs
8 Digital input module with eight inputs
9 Digital output module with four outputs
10 Inline station with a Loop 2 branch terminal

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.2.4 Loop 2 Product Description

Modules with digital and analog inputs and outputs, a temperature measurement module and a motor starter (e.g., to switch three-phase induction motors directly) are available within the Loop 2 product range.

I/O devices and supply are connected using the QUICKON insulation displacement method. The Loop 2 modules are connected to INTERBUS using a bus terminal module. Up to 63 bus devices can be connected to this bus terminal module.

Versions

All of the modules and the bus terminal module have IP 65/IP 67 protection whereas the Loop 2 motor starter has IP 54 protection.

The following modules are available:

- Bus terminal modules for connecting the Loop 2 system to the INTERBUS remote bus
- Loop 2 branch terminal (branch from the Inline system)
- Module with four digital inputs
- Module with eight digital inputs
- Module with four digital outputs
- Module with two digital inputs and two digital outputs
- Power module with four digital inputs
- Module with two analog inputs
- Module with one analog output (current)
- Module with one analog output (voltage)
- Analog module for two temperature sensors
- 4-channel motor starter

System requirements

The INTERBUS system with a controller board with firmware version 4.40 (G4) or later must be used to ensure optimum use of all system and diagnostic functions.

For configuration, parameterization, and visualization of the system, CMD software version 4.40 or later is available for standard controller boards. When using a Field Controller, PC WORX software version 2.x or later is available.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Positioning

Loop 2 modules with IP 65/IP 67 protection are designed for applications in the field. These modules can be directly used on machines or in systems.

Mounting

Loop 2 modules are directly screwed on a suitable (even) grounded mounting surface. In this way, the functional earth ground is connected.

I/O connection

The inputs/outputs of sensors/actuators are connected to the I/O modules using 5-pos. M12 connectors.

Digital sensors can be connected using the 4-wire connection method (signal, U_S, 0 V, functional earth ground). Digital actuators can be connected using the 3-wire connection method (signal, 0 V, functional earth ground).

Bus connection

An INTERBUS Loop 2 system is connected to the INTERBUS remote bus using a bus terminal module. This connection can made using SAB connector hoods or the Loop 2 branch terminal from an Inline system.

The bus terminal module adapts the bus signal to the Loop 2 system and sends the adapted data to the connected modules via a Loop cable. The Loop cable is connected using the QUICKON connection method (insulation displacement).

For additional information on the connection, please refer to the individual sections.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.2.5 System Specifications

Table 1-1 INTERBUS Loop 2 system specifications

INTERBUS Loop 2 System Specifications	
Permitted total length of the Loop 2	200 m (656.17 ft.)
Minimum distance between - Bus terminal module and first module - Two modules - Last module and bus terminal module	0.2 m (0.66 ft.)
Maximum distance between - Bus terminal module and first module - Two modules - Last module and bus terminal module	20 m (65.62 ft.)
Max. number of Loop 2 modules	63
Maximum current carrying capacity of the Loop 2 system	1.8 A
Minimum voltage at the device	19.2 V

The permissible number of devices that can be connected depends on the specific station structure. None of the above mentioned limit parameters may be exceeded.

The number of modules that can be connected to a bus terminal module depends on the current consumption of the modules. The maximum current carrying capacity of the bus terminal module (1.8 A) must not be exceeded.

Observe the voltage drops in the system. For safe bus operation, 19.2 V (including ripple) must be available as supply to each module (see "Measuring Voltage Drop"on page 4-51).

To ensure the 19.2 V, voltage can be re-injected into a Loop 2 system via the power module (IB L2 BOX 24 PWR IN DI 4/4 M12).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.3 INTERBUS S-Line as Part of the INTERBUS Loop System

The INTERBUS S-Line modules have been designed for special operating conditions in the field of mechanical engineering. They are especially suitable if signals are to be processed when only little space is available, and under extreme ambient conditions.

The small housings of the INTERBUS S-Line modules have IP 65/IP 67 protection. The sensors and actuators are connected via M8 connectors. In this way the modules can be directly used in the machine.

Bus connection

The INTERBUS S-Line modules are always integrated in INTERBUS Loop 2. There are two possibilities:

1. Bus connection as branch line
   A twin box is integrated in the INTERBUS Loop ring using the QUICKON connection method. Up to two S-Line modules can be connected to this twin box using M12 connectors (see page 1-19).
2. Bus connection as ring system
   From the Loop 2 branch terminal in an Inline system, the bus structure is established as ring system using Loop 2 M12 cables (see page 1-20). Green Y connectors or ADAP boxes are installed in this ring. To these the S-Line modules are connected using M12 connectors.

The bus is always connected to the S-Line modules using M12 connectors. This is why the system is also referred to as INTERBUS Loop 2 M12.

Safety circuit

A safety circuit can be integrated into the Loop 2 system. The signals of this circuit are processed further using an Inline safety terminal. A yellow Y connector is inserted in the ring to which an emergency stop button for example can be connected (see page 1-22).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.3.1 S-Line Product Description

Modules with up to eight digital inputs and outputs are available within the S-Line product range.

The S-Line modules are integrated into INTERBUS Loop 2 using a branch line (twin box) or a ring line (Y connector, ADAP boxes).

Versions

The following modules are available:

– Module with eight digital inputs
– Module with eight digital outputs
– Module with four digital outputs, each with a load capacity of 2 A
– Module with four digital inputs and four digital outputs
– Module with four illuminated pushbuttons

System requirements

S-Line has the same system requirements as Loop 2 (see page 1-14). The basic system specifications are also the same as for Loop 2 (see page 1-16).

Positioning

S-Line modules with IP 67 protection are designed for applications in the field. These modules can be directly used on machines or in systems.

Mounting

S-Line modules can either be screwed directly on a suitable even grounded mounting surface or on suitable machine profiles. This can be carried out from the front or from the side. Suitable screws and hammer slots are available as an accessory.

I/O connection

The inputs/outputs of sensors/actuators are connected to the I/O modules using 3-pos. M8 connectors.

Bus connection

The bus is connected to the S-Line modules using preassembled bus cables with M12 connectors. The S-Line modules can be connected to INTERBUS Loop 2 using a twin box (branch line) or green Y connectors or ADAP boxes (ring system).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

1.3.2 S-Line Example Topology

Bus Connection as Branch Line

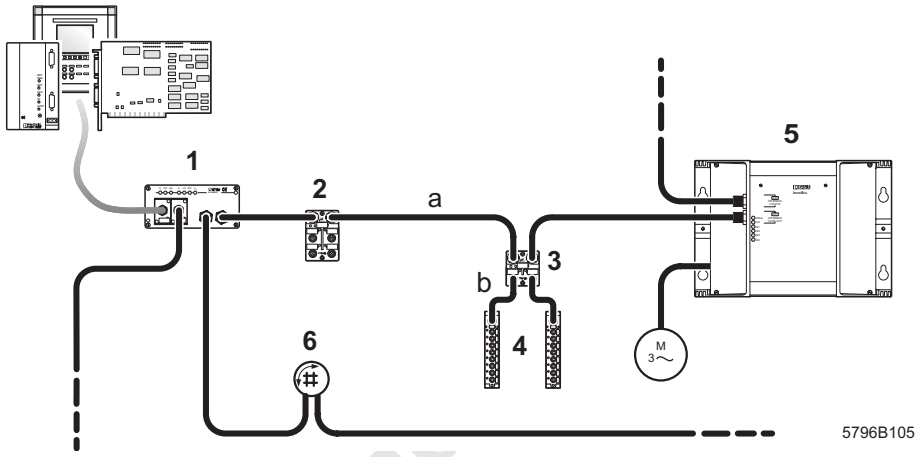


Figure 1-3 Example topology with a twin box (branch line)

Key:

1 Loop 2 bus terminal module
2 Loop 2 module
3 Twin box
4 S-Line module
5 Loop 2 motor starter/frequency inverter
6 Loop 2 encoder

The twin box is used to integrate one or two S-Line modules into a Loop 2 system (detailed description see page 2-18).

Unused twin box connections must be closed with a short-circuit connector

The twin box is not a bus device. It is important that it is not considered as such for configuration and diagnostics.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

In the example, the incoming bus cable of module 4 extends as far as module 2, including the twin box and cable sections a and b. An error in the incoming bus of module 4 could therefore also be in the forward line (INTERBUS IN) between module 2 and the twin box (a).

Bus Connection as Ring System

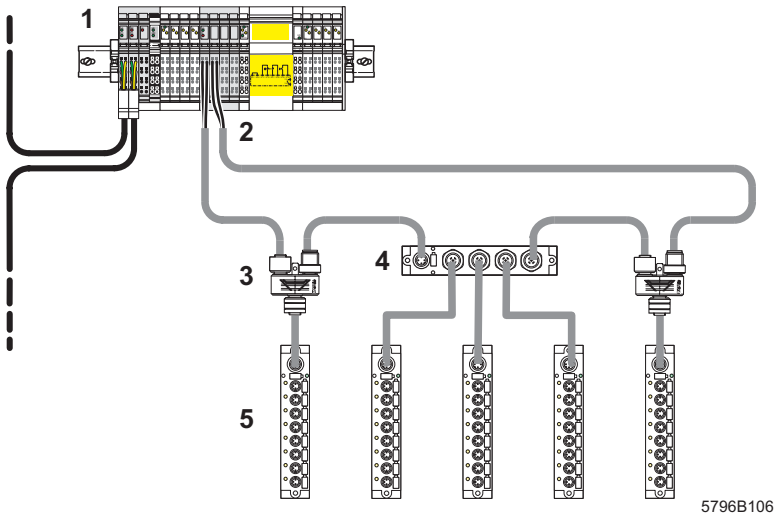


Figure 1-4 Example topology of a Loop 2 M12 ring system

Key:

1 Inline station
2 Loop 2 branch terminal
3 Green Y connector
4 ADAP box
5 S-Line module

In the Loop 2 M12 ring system, each bus device that is to be connected is assigned a green Y connector or a ADAP box, which leads the IN and OUT line of the Loop 2 into the branch. See "Green Y Connector (Bus Connection)"on page 2-21 or "ADAP Box (Bus Connection)"on page 2-24 for a detailed description.

Y connectors and ADAP boxes are not bus devices. It is important that they are not considered as such for configuration and diagnostics.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

If, for example, an error is indicated on the outgoing bus cable of a module, the error may have occurred at the following places:

– At the connection between the module and the Y connector or the module and the ADAP box
– In the forward line to the next Y connector or to the ADAP box (INTERBUS IN)
– At this Y connector or this ADAP box
– At the connection of this Y connector/this ADAP box to the next module

The Y connector can be connected to the relevant Loop 2 module by a Loop 2 M12 cable or by directly inserting the Y connector on the module.

If the module is used in an environment with high levels of mechanical strain, it should not be connected to the bus by directly inserting the Y connector, but using a standard Loop 2 M12 cable.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Loop 2 Ring System with Safety Circuit

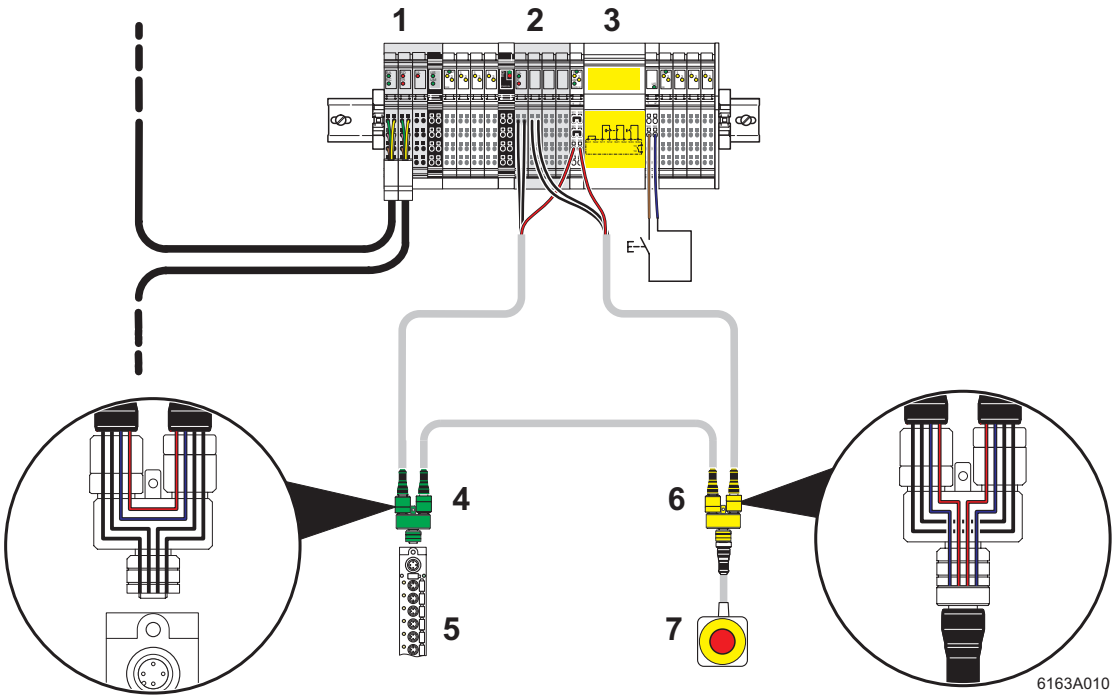


Figure 1-5 Example topology of a Loop 2 system with safety circuit

Key:

1 Inline bus terminal
2 Loop 2 branch terminal
3 Inline safety terminal
4 Green Y connector for bus tap
5 Digital input module
6 Yellow Y connector for safety circuit tap
7 Emergency stop button

A safety circuit is created using the two additional cables (brown and white), which are present in the Loop 2 M12 cable. These cables can be tapped via a yellow Y connector (6). The safety circuit signals can then be processed further via an Inline safety terminal (3).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 2

This section informs you about
– the INTERBUS Loop 2 product gorups
– the INTERBUS S-Line product groups

Product Groups 2-3

2.1 Loop 2 Bus Terminal Module 2-3
2.2 Loop 2 Branch Terminal 2-6
2.3 Digital Loop 2 Devices 2-7
2.4 Analog Loop 2 Devices 2-9
2.5 Loop 2 Motor Starter 2-12
2.6 Loop 2 Power Module 2-14
2.7 INTERBUS S-Line 2-15
2.7.1 Product Range 2-15
2.7.2 Digital S-Line Modules 2-15
2.7.3 Information on Configuration and Diagnostics 2-17
2.7.4 Twin Box (Bus Connection) 2-18
2.7.5 Green Y Connector (Bus Connection) 2-21
2.7.6 ADAP Box (Bus Connection) 2-24
2.7.7 Yellow Y Connector (Safety Circuit) 2-26
2.7.8 M8 Y Connector (Actuator Supply) 2-29

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2 Product Groups

2.1 Loop 2 Bus Terminal Module

A Loop 2 bus terminal module is available for the INTERBUS Loop 2 system, with which the INTERBUS Loop 2 is directly connected to the INTERBUS remote bus or the INTERBUS installation remote bus.

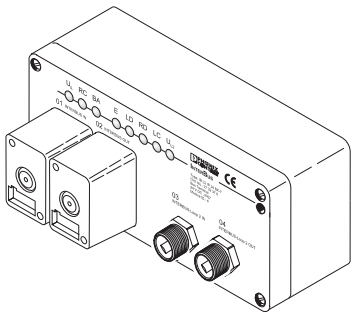


Figure 2-1 IBS L2 IP 24 BK-T bus terminal module

Housing

For the housing dimensions, please refer to Figure 3-1 on page 3-3.

Function

The bus terminal module forms the head of a Loop 2 system. It connects the modules of a Loop 2 system to the INTERBUS remote bus and performs the required bus signal conditioning.

The bus terminal generates the communications voltage for the connected devices from the supply voltage. It also provides the supply of the connected analog modules and the sensor supply of the digital input modules.

The bus terminal module also allows you to disconnect or reconnect the Loop 2 system from or to the network using the application software.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Connections

The following cables can be connected to the bus terminal module:

– Incoming and outgoing INTERBUS remote bus
  INTERBUS is connected using SAB connector hoods.
– Incoming and outgoing installation remote bus. In the installation remote bus, the supply for the bus logic and I/O is provided.
  INTERBUS is connected using SAB connector hoods.
– Incoming and outgoing INTERBUS Loop 2.
  INTERBUS Loop 2 is connected using the QUICKON connection method.

Digital actuators must be supplied separately at the corresponding module.

Voltage supply of the bus terminal module

The bus terminal module supplies communications voltage to the module electronics of the connected modules. If this supply voltage is switched off, the bus stops.

The voltage supply of the actuators should be installed and protected independently of the voltage supply of the INTERBUS module electronics. In this way INTERBUS continues to run even if some I/O devices have been switched off (see also "Power Concept"on page 4-9).

When using an emergency stop circuit, only the voltage supply of the actuators may be connected to the emergency stop circuit. Errors can then be detected with the sensors in the emergency stop state.

For the operation of INTERBUS Loop 2 with "maximum structure" (up to 63 Loop 2 devices at a maximum current carrying capacity of 1.8 A) it is possible to re-inject the supply voltage for INTERBUS Loop 2 in the field. See "Loop 2 Power Module"on page 2-14 and "Power Concept"on page 4-9.

The communications voltage of the devices depends on the supply voltage of the bus terminal module. It is therefore useful to supply the bus terminal module with an increased voltage (28.5 V).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Number of devices

The number of devices that you can connect to a bus terminal module is determined by several parameters:

– The maximum number of devices in INTERBUS is limited to 512.

– A maximum of 254 remote bus devices may be connected in INTERBUS.

– Up to 63 modules (local bus devices) can be connected to a Loop 2 bus terminal module
This number includes all devices after the bus terminal module.
If the Loop 2 system is integrated in an Inline station via a Loop 2 branch terminal, the device number includes both the Inline terminals of the station and the modules of Loop 2.
The devices of a remote bus branch connected to the Inline station do not affect the number of Loop 2 system or Inline station devices.

– The bus terminal module can supply a maximum current of 1.8 A in the logic area.
Therefore please note the logic current consumption and the sensor currents of every device when configuring a Loop 2 system (or an Inline station with an integrated Loop 2). This data is given in every module-specific data sheet. The current consumption can be different depending on the module.

Do Not Exceed the Limit Parameters!

The permissible number of devices that can be connected depends on the specific station structure. None of the above mentioned limit parameters may be exceeded.

Protection

The bus terminal module has short circuit protection through an electronic fuse.

LEDs

The diagnostic indicators of the bus terminal module indicate the Loop 2 state and the remote bus state, and indicate if the supply voltages are present or not (see "Bus Terminal Module Indicators"on page 3-18).

Functional earth ground

When mounting the module on a grounded mounting surface the module is grounded through the mounting screws (see "Structure of the Loop 2 Bus Terminal Module"on page 3-3 and Section "Grounding Concept" on page 4-11).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.2 Loop 2 Branch Terminal

Via a Loop 2 branch terminal, you can integrate a Loop 2 branch and its modules into an INTERBUS Inline station.

The Loop 2 branch terminal converts INTERBUS signals to the bus physics of Loop 2 and provides the supply voltage.

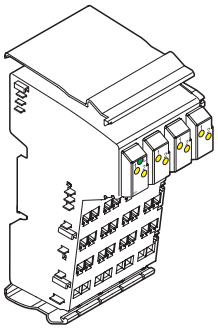


Figure 2-2 Loop 2 branch terminal IB IL 24 L2

Phoenix Contact recommends to supply INTERBUS Loop 2 via a separate power terminal. For additional information on the terminal, please refer to the module-specific data sheet.

If an increased voltage (28.5 V) is provided for the power terminal this voltage is also available in the Loop 2 system.

The Loop 2 branch terminal is not a device with protocol chip in the INTERBUS system. This branch terminal has no logical and physical device number. This must be considered during error diagnostics if two or more branch terminals are installed side by side.

If the Loop 2 system is integrated in an Inline station via a Loop 2 branch terminal, the local bus devices are also counted. Please take into account that a maximum of 63 devices can be connected to a bus terminal module (remote bus devices).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.3 Digital Loop 2 Devices

The following modules are available:

– Digital input modules with four inputs
– Digital input modules with eight inputs
– Digital output modules with four outputs
– Digital input/output modules with two inputs and two outputs

Housing

The size of the module housing varies according to the number of connections.

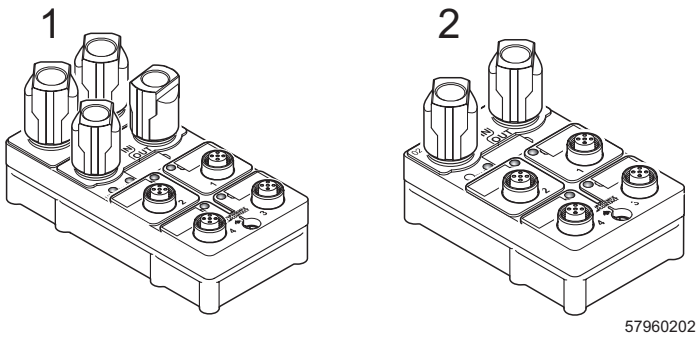


Figure2-3 Digital modules

1 Housing of the output modules and of the input and output modules
2 Housing of the input modules

For the housing dimensions, please refer to the figures on page 3-8.

Function

Digital output modules are used to network individual actuators, and digital input modules are used to read individual sensors. Individual actuators and individual sensors can be distributed on machines or in systems.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Input module connections

Using the input modules the incoming and outgoing INTERBUS Loop 2 and the I/O devices (sensors) are connected.

The INTERBUS Loop 2 cables are connected using the QUICKON connection method. The sensors are connected via M12 circular connectors.

Output module connections

Using the output modules the incoming and outgoing INTERBUS Loop 2, the I/O devices (actuators) and the supply of the actuators are connected.

The INTERBUS Loop 2 cables and the supply lines for the actuators are connected with the QUICKON connection method. The actuators are connected via M12 circular connectors.

Protection of Loop 2

Protection against polarity reversal is carried out internally via a bridge rectifier.

LEDs

The diagnostic and status indicators on the modules provide information on the bus and on the status of the inputs and outputs (see Section 3.4.2 on page 3-20).

Functional earth ground

When mounting the module on a grounded mounting plate the module is grounded through the mounting screws.

Voltage Supply for the Digital I/O Modules

Provision of the supply

The communications voltage is provided when connecting the supply voltages to the bus terminal module. The input modules are also supplied with the voltage supply for the sensors. Using the output modules the actuator supply must be supplied via additional supply lines.

Please note that bus supply and actuator supply should be electrically isolated (see also "Power Concept"on page 4-9).

To guarantee error-free bus operation always ensure actuator supply and bus supply are isolated.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.4 Analog Loop 2 Devices

The following modules are available:

– Analog input module with two inputs
– Output module with one current output
– Output module with one voltage output
– Analog module for two temperature sensors

Housing

All analog Loop 2 modules are of the same size.

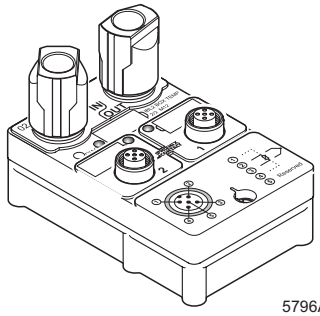


Figure2-4 Example of an analog Loop 2 module

For the housing dimensions, please refer to Figure 3-9 on page 3-11.

Input module connections

Using the input modules the incoming and outgoing INTERBUS Loop 2 and the I/O devices (sensors) are connected.

The INTERBUS Loop 2 cables are connected using the QUICKON connection method. The sensors are connected via M12 circular connectors.

Output module connections

Using the output modules the incoming and outgoing INTERBUS Loop 2 and the I/O devices (actuators) are connected.

The INTERBUS Loop 2 cables are connected using the QUICKON connection method. The actuators are connected via M12 circular connectors.

Protection of Loop 2

Protection against polarity reversal is carried out internally via a bridge rectifier.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

LEDs

The module diagnostic indicators provide information on the bus (see "Indicators for Analog I/O Modules"on page 3-22).

Shielding

Shielding of analog input modules is carried out via the IB L2 SHIELD shield plate supplied with the module.

Phoenix Contact only recommends connecting the shield via the IB L2 SHIELD shield plate for analog output modules in the case of extreme interference. The shield plate can be ordered as an accessory ("Ordering Data for Loop 2 Accessories"on page 7-4).

Functional earth ground

When mounting the module on a grounded mounting plate the module is grounded through the mounting screws. If the module cannot be fixed to a grounded mounting plate, use the IB L2 SHIELD shield plate for analog output modules. Connect the shield plate using a separate cable with a grounding point.

Parameterization

Analog input modules are parameterized via the INTERBUS OUT process data word (output data word).

Analog output modules are parameterized using the connector coding.

Some output modules can also be parameterized to other configurations through the output data words. Refer to the module-specific data sheet to find out if a specific analog module can be configured and how the output data words are assigned.

Diagnostics in the input data word

Error detection is implemented via the input data word (process data).

Analog input modules have overrange recognition in all measuring ranges.

Open circuit is indicated in the 4 mA to 20 mA range.

Open circuit can also be indicated for modules used to connect thermocouples (for module-specific data, please refer to the appropriate data sheets).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Extended diagnostics

Some data formats support extended diagnostics. If extended diagnostics are available for a specific module, it is indicated in the module-specific data sheet.

Possible error messages are listed in Table 2-1.

Table 2-1 Error messages for analog input modules

Code (hex)	Error
8001	Under range
8002	Open circuit
8004	Measured value invalid
8008	Cold junction defective
8010	Configuration invalid
8020	Supply voltage defective
8040	Module faulty
8080	Overrange

Voltage Supply for Analog Input and Output Modules

Provision of the supply

All required supply voltages (communications voltage, sensor supply and actuator supply) are provided when connecting the supply voltages to the bus terminal module.

An electrically isolated I/O supply is generated from the supply voltage of the bus terminal module.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.5 Loop 2 Motor Starter

Housing

For the housing dimensions, please refer to Figure 3-10 on page 3-12.

Function

The INTERBUS Loop 2 motor starter can operate either as a direct starter or as a reversing-load motor starter in electromechanical versions.

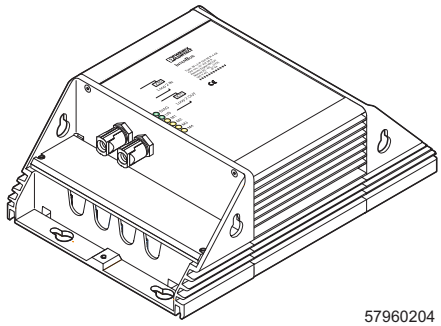


Figure 2-5 INTERBUS Loop 2 motor starter IB L2 IP 500 MLR 4-6A

Features

- Direct starting for four or reversing-load operation for two independent motors
- Integrated motor protection for each motor by means of thermistor current or thermostatic switches
- Line voltage up to 500 V AC
- Motors can be switched off independently at overtemperature
- Actuators (power section) can be deactivated independently of INTERBUS Loop 2.
- Connectors for supply voltage, actuator voltage (power supply), motor and PTC input

Connections

The following cables can be connected to the motor starter:

- Incoming and outgoing INTERBUS Loop 2
- Motor 1 to motor 4
- 4 thermistors
- Actuator supply
- Line input/output

Connection method

The following connection methods are used for the motor starter:

- Incoming and outgoing INTERBUS Loop 2 (QUICKON)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

– Motor 1 to motor 4 (POWER-COMBICON)
– Four thermistors (MINI-COMBICON)
– Actuator supply (POWER-COMBICON)
– Line input/output (POWER-COMBICON)

The connector pin assignment of the MINI and POWER COMBICON connectors is specified in the module-specific data sheet.

Provision of the supply

The communications voltage for the motor starter is provided via the Loop 2 cable. The PTC detectors (thermistors) and the actuators (power section) are supplied with power by means of a 24 V connection (actuator supply).

The motor starter is also connected to a 3-phase system supply.

Protection

The motor starter does not have any built-in protection. The short-circuit protection according to IEC 60947 must be implemented in a separate device.
For additional information, please refer to the module-specific data sheet.

Protection of Loop 2

Protection against polarity reversal is carried out internally via a bridge rectifier.

LEDs

The diagnostic and status indicators on the module provide information on the bus and on the status of the connected device (see "Indicators of the Loop 2 Motor Starter"on page 3-23).

Grounding

The motor starter is connected to the flange via the PE connection (protective earth ground).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.6 Loop 2 Power Module

Housing

For the housing dimensions, please refer to Figure 3-7 on page 3-9.

Function

The Loop 2 power module is used to re-inject the supply voltage in the Loop 2 system if the maximum total current of 1.8 A is reached. The module can also be used as an input module with four digital inputs.

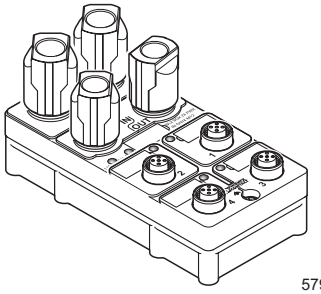


Figure 2-6 INTERBUSLoop 2 power module

Connections

The incoming and outgoing INTERBUS Loop 2, the input devices (sensors) and the power for supplying the modules are connected at the power module. (The voltage is supplied opposite the data direction and the module counting method.)

Connection method

The INTERBUS Loop 2 cables and the supply lines are connected using the QUICKON connection method. The sensors are connected via M12 circular connectors.

Protection of Loop 2

Protection against polarity reversal is carried out internally via a serial diode.

To guarantee error-free bus operation always ensure that both actuator supply and bus supply are protected independently.

LEDs

The diagnostic and status indicators on the modules provide information on the bus and on the status of the inputs and power supply (see "Indicators of Digital I/O Modules"on page 3-20).

Functional earth ground

When mounting the module on a grounded mounting plate the module is grounded through the mounting screws.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7 INTERBUS S-Line

2.7.1 Product Range

For detailed description, please refer to "INTERBUS S-Line as Part of the INTERBUS Loop System"on page 1-17.

The INTERBUS S-Line modules can be integrated in INTERBUS Loop 2. They can especially be used when only little space is available on the machine.

2.7.2 Digital S-Line Modules

The following modules are available:

– Module with eight digital inputs
– Module with eight digital outputs
– Module with four digital outputs, each with a load capacity of 2 A
– Module with four digital inputs and four digital outputs
– Module with four illuminated pushbuttons

Housing

For the housing dimensions, please refer to "Dimensions of the S-Line Modules"on page 3-13.

Connections

INTERBUS Loop 2 is connected to these modules using M12 connectors. The incoming and the outgoing bus is connected to these M12 connectors. In order to integrate the S-Line modules in a Loop 2 system an intermediate station (twin box, see page 2-18) is necessary to adapt Loop 2 to Loop 2 M12.

From a Loop 2 branch terminal the S-Line modules can also be operated via Loop 2 M12 cables only. For this an intermediate station (Y connector, see page 2-21, or ADAP box, see page 2-24) is also required.

The digital output module with four outputs
(IB L2-M BOX 24 DO 4/4 M8-2A) provides a M12 connection for the actuator supply. For the other modules with outputs the actuator supply can

online-components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

be connected to any output. If you want to use all outputs, you must install an M8 Y connector (see page 2-29). This connector enables the connection of the actuator supply and the output.

The sensors and actuators are connected via 3-pos. M8 connectors.

LEDs

The module diagnostic indicators (green) provide information on the states of the bus and communications voltage. Output modules additionally provide a diagnostic indicator for the actuator supply.

The status indicators (yellow) provide information on the states of the inputs and outputs (see "Indicators of the S-Line Modules"on page 3-25).

Functional earth ground

Functional earth grounding on the S-Line modules is not required.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7.3 Information on Configuration and Diagnostics

Configuration

When configuring Loop 2 M12, the configuration of a branch line or ring line must be considered separately. As the branch line contains the forward and return path, the voltage drop must be doubled when considering the sizing.

To determine the total voltage drop, specific voltage drops can be assumed at an average current of 1.25 A.

Table 2-2 Determining the voltage drop

Item	Assumed Voltage Drop per Item
Twin box	0.1 V
Y connector	0.1 V
ADAP box	0.1 V
Loop 2 M12 module	0.1 V
Loop 2 M12 cable (ring)	0.1 V/m
Loop 2 M12 cable (branch)	0.2 V/m
Loop 2 cable	0.03 V/m

Diagnostics

As with configuration, it must be noted for error diagnostics that a branch line contains the forward and return path. As the twin box, Y connector and ADAP boxes are not INTERBUS devices, the error source may not only be on the path to these components, but could be anywhere up to the next INTERBUS device. Therefore we recommend using preassembled cables to keep error sources to a minimum.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7.4 Twin Box (Bus Connection)

Housing

For the housing dimensions, please refer to Figure 3-14 on page 3-15.

Function

The twin box is used to connect S-Line modules to INTERBUS Loop 2. The twin box is integrated in Loop 2 using the QUICKON connection method and enables the connection of two S-Line modules via M12 female connectors (see "Bus Connection as Branch Line"on page 1-19). For this you need a special 4-wire Loop 2 M12 cable (see "Assembling Loop 2 M12 Cables"on page 4-43).

Unused M12 female connectors must be closed with a short-circuit connector (SAC-4P-M12MS L2 SCP). Bus operation is not possible with an unused M12 female connector.(see "Short-Circuit Connector"on page 2-20).

The twin box does not contain any active components, i.e., it is not an INTERBUS device.

Connections

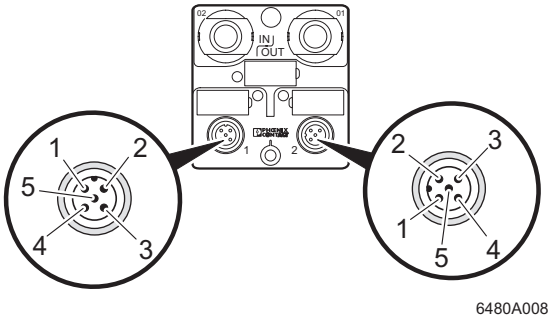


Figure 2-7 Pin assignments of the twin box

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Loop 2 connection

Connection	Signal
1	INTERBUS Loop 2 OUT
2	INTERBUS Loop 2 IN

Loop 2 connection 1

Pin	Assignment
1	IN+
2	OUT-
3	IN-
4	OUT+
5	-

Loop 2 connection 2

Pin	Assignment
1	IN+
2	OUT-
3	IN-
4	OUT+
5	-

Internal circuit diagram

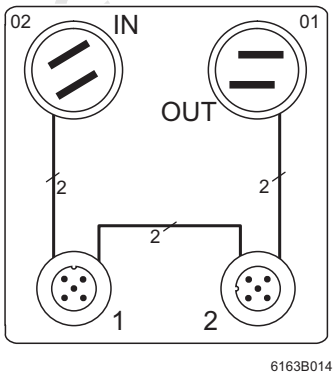


Figure 2-8 Circuit diagram of the twin box

online components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Short-Circuit Connector

Unused M12 female connectors must be closed with a short-circuit connector (SAC-4P-M12MS L2 SCP). Bus operation is not possible with an unused M12 female connector.

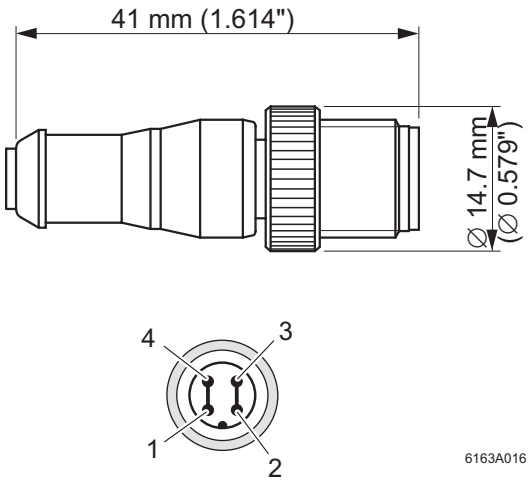


Figure 2-9 Short-circuit connector

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7.5 Green Y Connector (Bus Connection)

Function

The green Y connector is used to connect one S-Line module to Loop 2 M12 (see "Bus Connection as Ring System"on page 1-20).

If the module is used in an environment with high levels of mechanical strain, it should not be connected to the bus by directly inserting the Y connector into the S-Line module, but using a standard Loop 2 M12 cable.

The Y connector does not contain any active components, i.e., it is not an INTERBUS device.

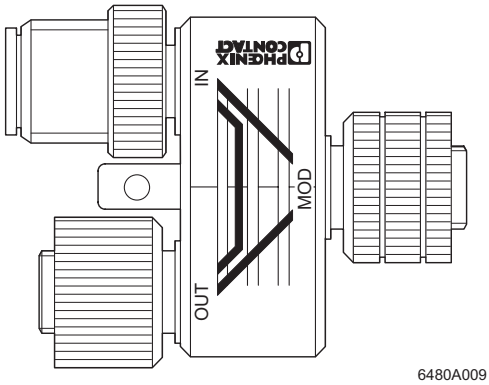


Figure 2-10 Connections of the green Y connector

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Internal pin assignment

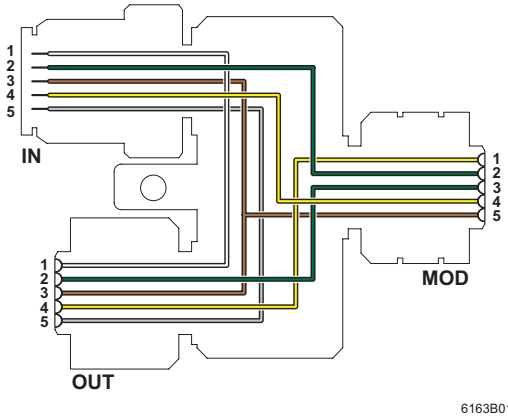


Figure 2-11 Pin assignment of the green Y connector

IN

Pin	Assignment
1	Safety circuit IN
2	Loop IN-
3	Multi-function circuit IN
4	Loop IN+
5	Parallel cable

MOD

Pin	Assignment
1	Loop IN+
2	Loop OUT-
3	Loop IN-
4	Loop OUT+
5	Multi-function circuit OUT

OUT

Pin	Assignment
1	Safety circuit OUT
2	Loop OUT-

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Pin	Assignment
3	Multi-function circuit OUT
4	Loop OUT+
5	Parallel cable

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7.6 ADAP Box (Bus Connection)

Housing

For the housing dimensions, please refer to Figure 3-11 on page 3-13. The dimensions are the same as for the S-Line module with eight connections.

Function

The green ADAP box is used to connect up to three S-Line modules to Loop 2 M12 (see Figure 1-4 on page 1-20).

Unused M12 female connectors must be closed with a short-circuit connector (SAC-4P-M12MS L2 SCP). Bus operation is not possible with an unused M12 female connector (see "Short-Circuit Connector"on page 2-20).

The ADAP box does not contain any active components, i.e., it is not an INTERBUS device.

Connections

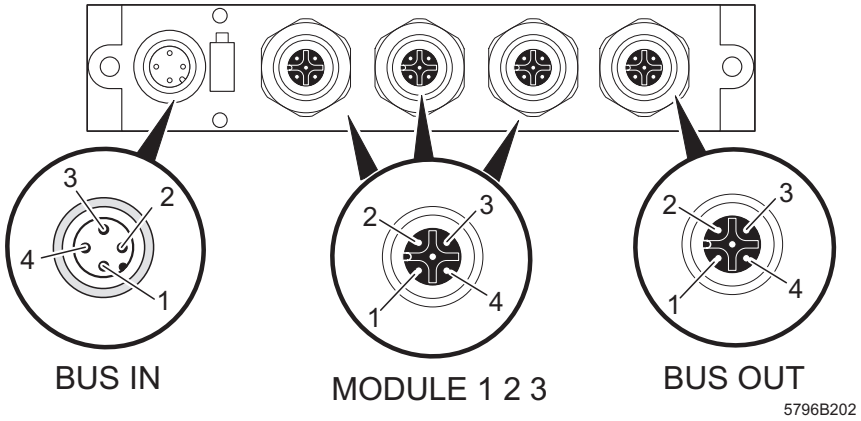


Figure 2-12 Pin assignments of the ADAP box

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Loop 2 M12 (BUS IN)

Pin	Assignment
1	OUT+
2	IN-
3	OUT-
4	IN+

Loop 2 M12 (Module connections 1, 2 and 3)

Pin	Assignment
1	IN+
2	OUT-
3	IN-
4	OUT+
5	-

Loop 2-M12 (BUS OUT)

Pin	Assignment
1	IN+
2	OUT-
3	IN-
4	OUT+
5	-

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7.7 Yellow Y Connector (Safety Circuit)

Function

A yellow Y connector is used to create a safety circuit in the Loop 2 ring to which an emergency stop button for example can be connected. For this parallel cables in the Loop 2 ring are further used by an Inline safety terminal (see "Loop 2 Ring System with Safety Circuit"on page 1-22).

The Y connector does not contain any active components, i.e., it is not an INTERBUS device.

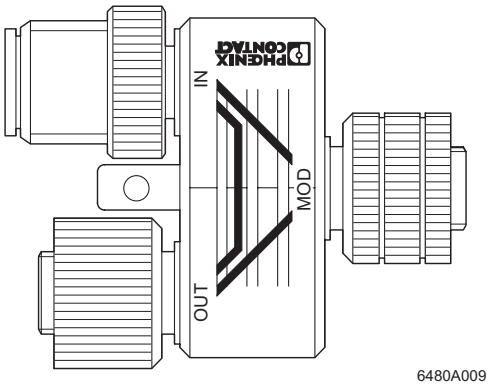


Figure 2-13 Connections of the yellow Y connector

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Internal Pin Assignment

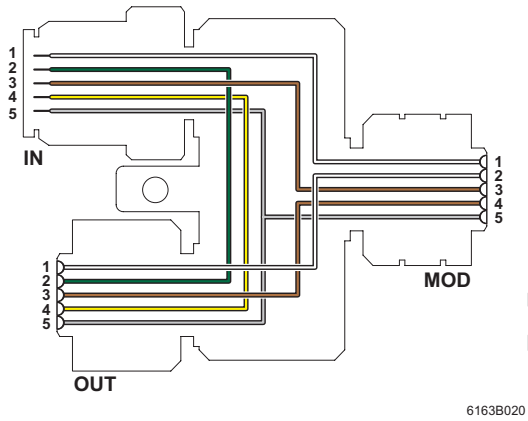


Figure 2-14 Pin assignment of the yellow Y connector

IN

Pin	Assignment
1	Safety circuit IN
2	Loop OUT-
3	Multi-function circuit IN
4	Loop OUT+
5	Parallel cable

MOD

Pin	Assignment
1	Safety circuit IN
2	Safety circuit OUT
3	Multi-function circuit IN
4	Multi-function circuit OUT
5	Parallel cable

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

OUT

Pin	Assignment
1	Safety circuit OUT
2	Loop OUT-
3	Multi-function circuit OUT
4	Loop OUT+
5	Parallel cable

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

2.7.8 M8 Y Connector (Actuator Supply)

Function

For modules with digital outputs without additional actuator supply connection the actuator supply can be connected to any output. However, if you want to use all outputs you can insert a M8 Y connector. The output and actuator supply can be connected to this connector.

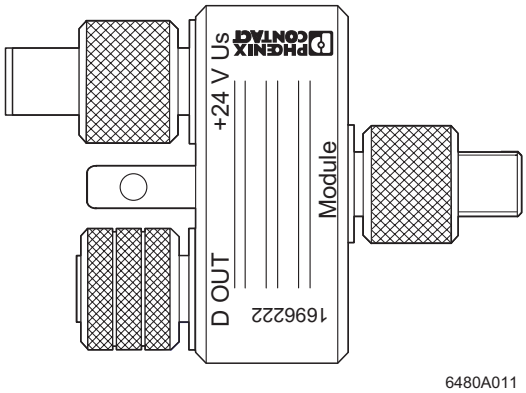


Figure 2-15 Connections of the black M8 Y connector

Internal Pin Assignment

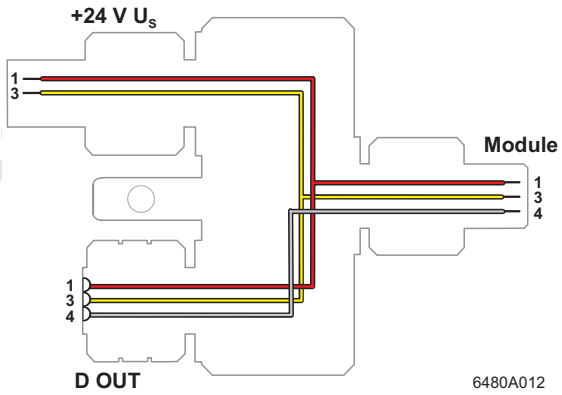


Figure 2-16 Pin assignment of the black M8 Y connector

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

D OUT

Pin	Assignment
1	24 V ($U_{S)}$
4	Output
3	0 V (U_S)

+24 V U_S

Pin	Assignment
1	24 V (U_S)
4	Not used
3	0 V (U_S)

Module

Pin	Assignment
1	24 V (U_S)
4	Output
3	0 V (U_S)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 3

This section informs you about
– the module structure
– the housing dimensions
– the diagnostic and status indicators

Description of the Modules 3-3

3.1 Structure of the modules 3-3
3.1.1 Structure of the Loop 2 Bus Terminal Module 3-3
3.1.2 Structure of a Loop 2 input Module 3-4
3.1.3 Structure of a Loop 2 Output Module 3-5
3.1.4 Structure of the Loop 2 Motor Starter 3-6
3.1.5 Structure of an S-Line Module 3-7
3.2 Dimensions of the Modules 3-8
3.2.1 Dimensions of the Loop 2 Bus Terminal Module 3-8
3.2.2 Dimensions of Digital Loop 2 Modules 3-9
3.2.3 Dimensions of Analog Loop 2 Modules 3-11
3.2.4 Dimensions of the Loop 2 Motor Starter 3-12
3.2.5 Dimensions of the S-Line Modules 3-13
3.2.6 Dimensions of the Twin Box 3-15
3.3 Labeling of I/O Modules 3-16
3.4 Diagnostic and Status Indicators 3-17
3.4.1 Bus Terminal Module Indicators 3-18
3.4.2 Indicators of Digital I/O Modules 3-20
3.4.3 Indicators of the Power Module 3-21
3.4.4 Indicators for Analog I/O Modules 3-22
3.4.5 Indicators of the Loop 2 Motor Starter 3-23
3.4.6 Indicators of the S-Line Modules 3-25

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3 Description of the Modules

3.1 Structure of the modules

3.1.1 Structure of the Loop 2 Bus Terminal Module

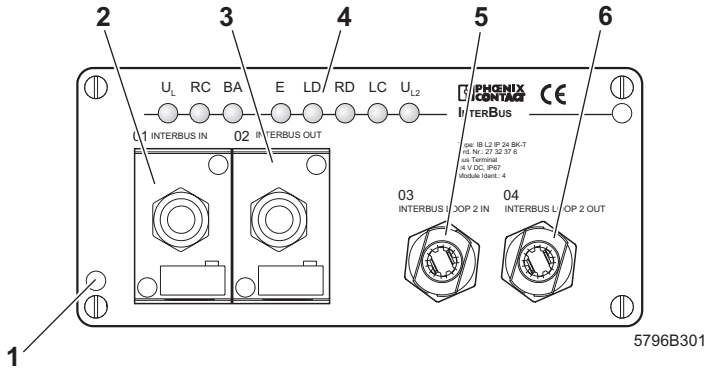


Figure 3-1 Structure of the IB L2 IP 24 BK-T bus terminal module

1 Mounting screw (connection to the functional earth ground - FE)
2 Incoming remote bus or installation remote bus (INTERBUS IN)
3 Outgoing remote bus or installation remote bus (INTERBUS OUT)
4 Diagnostic LEDs
5 Incoming INTERBUS Loop 2 (Loop 2 IN)
6 Outgoing INTERBUS Loop 2 (Loop 2 OUT)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.1.2 Structure of a Loop 2 input Module

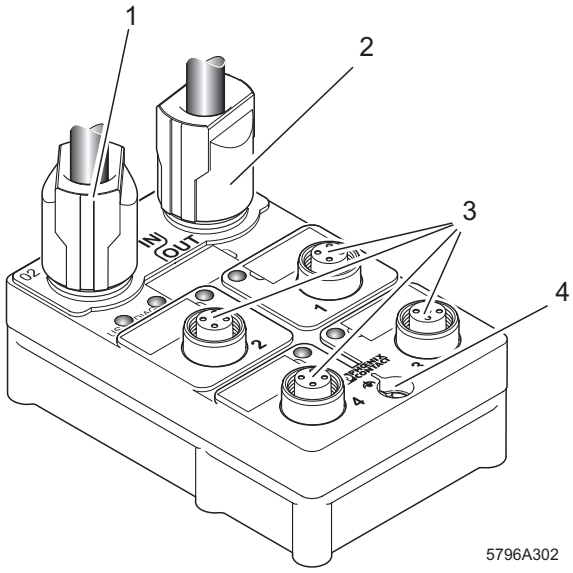


Figure 3-2 Structure of a Loop 2 input module

1 Incoming INTERBUS Loop 2 (Loop 2 IN)
2 Outgoing INTERBUS Loop 2 (Loop 2 OUT)
3 Sensor connections
4 Mounting screw (connection to the functional earth ground - FE)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.1.3 Structure of a Loop 2 Output Module

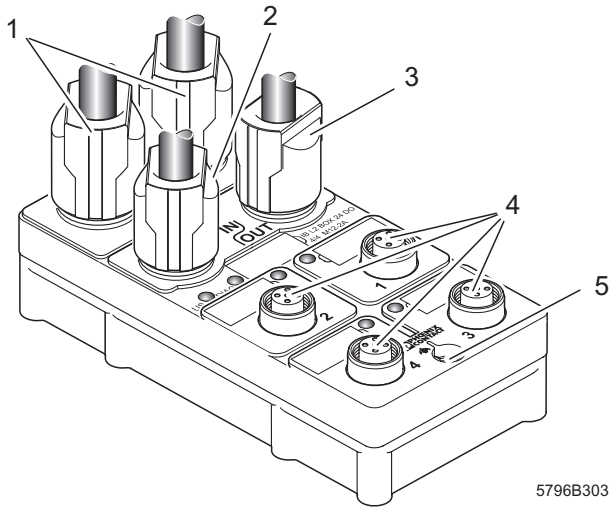


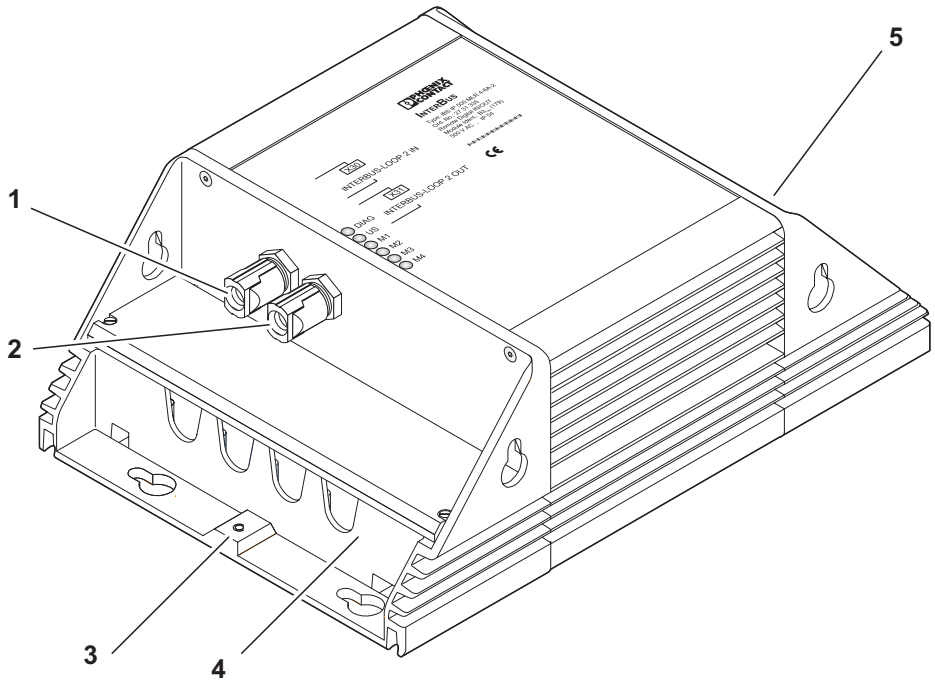
Figure 3-3 Structure of a Loop 2 output module

1 Connections of the 24 V supply voltage for the actuators
2 Incoming INTERBUS Loop 2 (Loop 2 IN)
3 Outgoing INTERBUS Loop 2 (Loop 2 OUT)
4 Actuator connections
5 Mounting screw (connection to the functional earth ground - FE)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.1.4 Structure of the Loop 2 Motor Starter



57960304

Figure 3-4 Structure of the Loop 2 motor starter

1 Incoming INTERBUS Loop 2 (Loop 2 IN)
2 Outgoing INTERBUS Loop 2 (Loop 2 OUT)
3 Connection for equipotential bonding
4 Left terminal connection compartment
5 Right terminal connection compartment

online

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.1.5 Structure of an S-Line Module

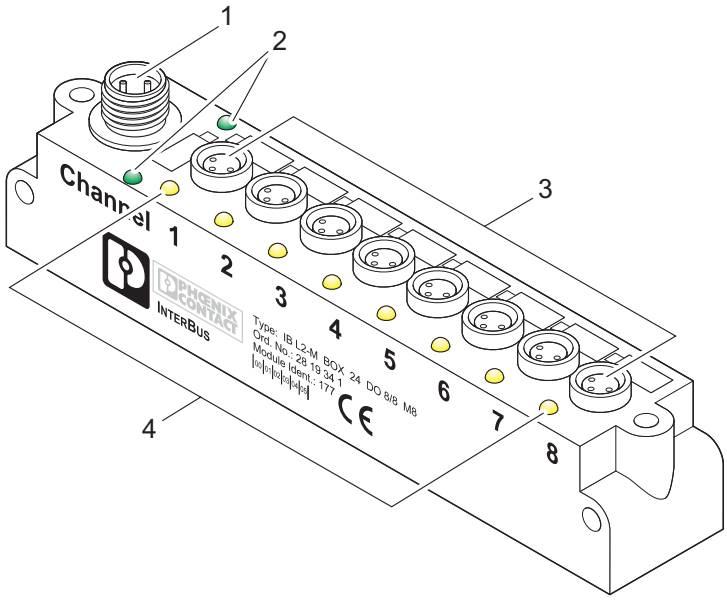


Figure 3-5 Structure of an S-Line module (example)

1 INTERBUS Loop 2 M12 connection
2 Diagnostic LEDs
3 Digital inputs and outputs
4 Status LEDs

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.2 Dimensions of the Modules

The modules of the INTERBUS Loop 2 range have different housing sizes. The following figures show the housing dimensions.

3.2.1 Dimensions of the Loop 2 Bus Terminal Module

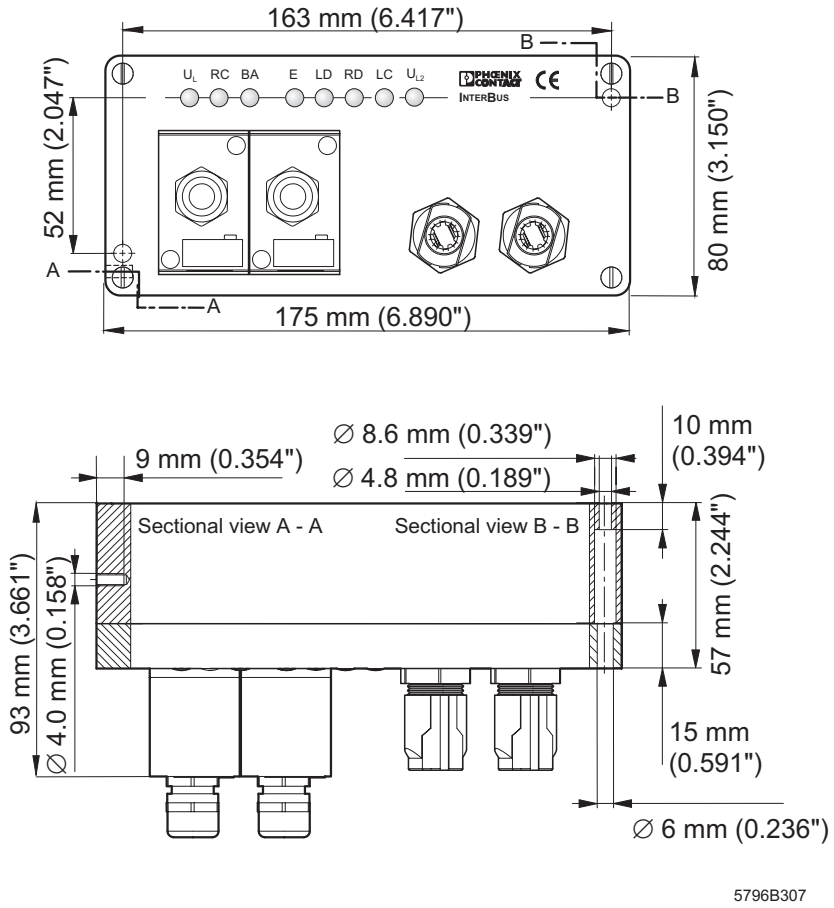


Figure 3-6 Dimensions of the bus terminal module

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.2.2 Dimensions of Digital Loop 2 Modules

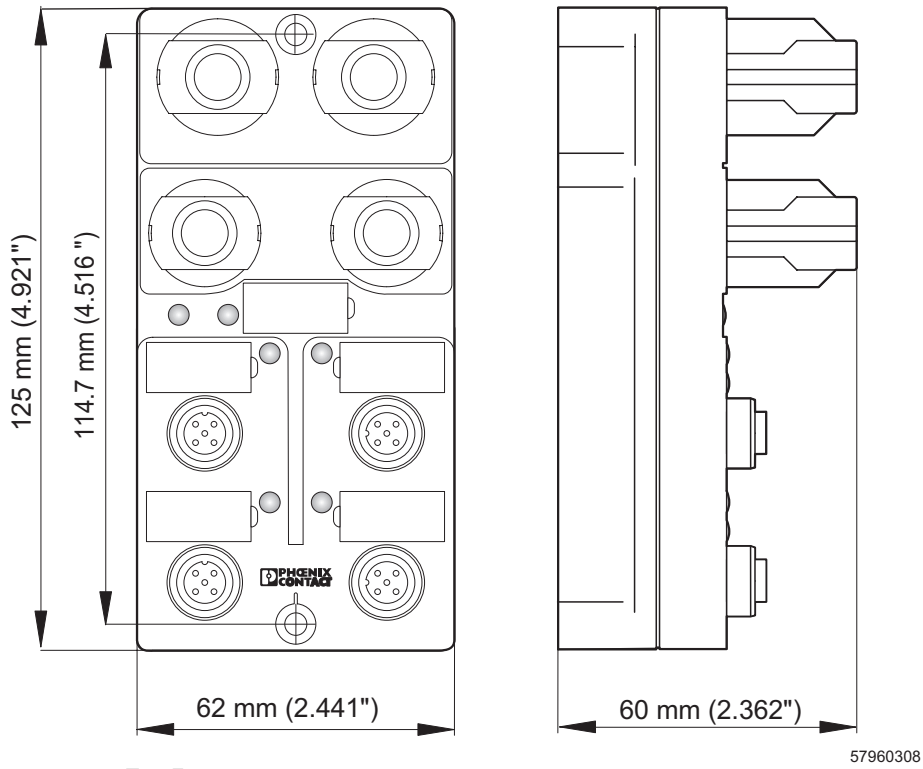


Figure 3-7 Dimensions of digital Loop 2 modules

In Figure 3-7 the housing dimensions of the following modules are shown:

– I/O module with two digital inputs and two digital outputs
– Output module with four digital outputs
– Power module with four digital inputs

onlinec

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

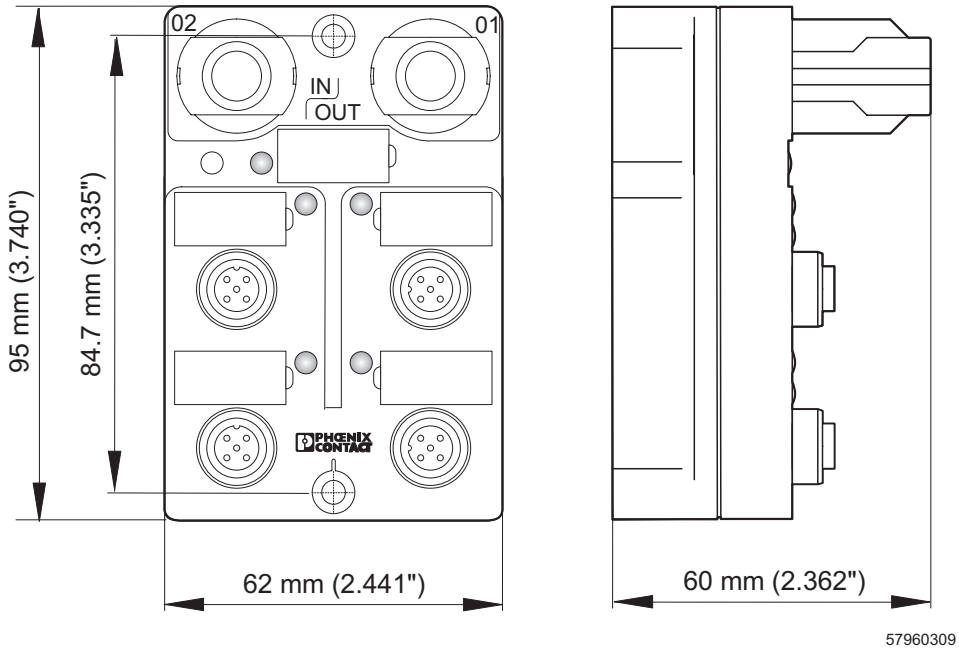


Figure 3-8 Dimensions of the digital input module

In Figure 3-8 the housing dimensions of the following modules are shown:

– Input module with four digital inputs
– Input module with eight digital inputs

onlinecomponents

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.2.3 Dimensions of Analog Loop 2 Modules

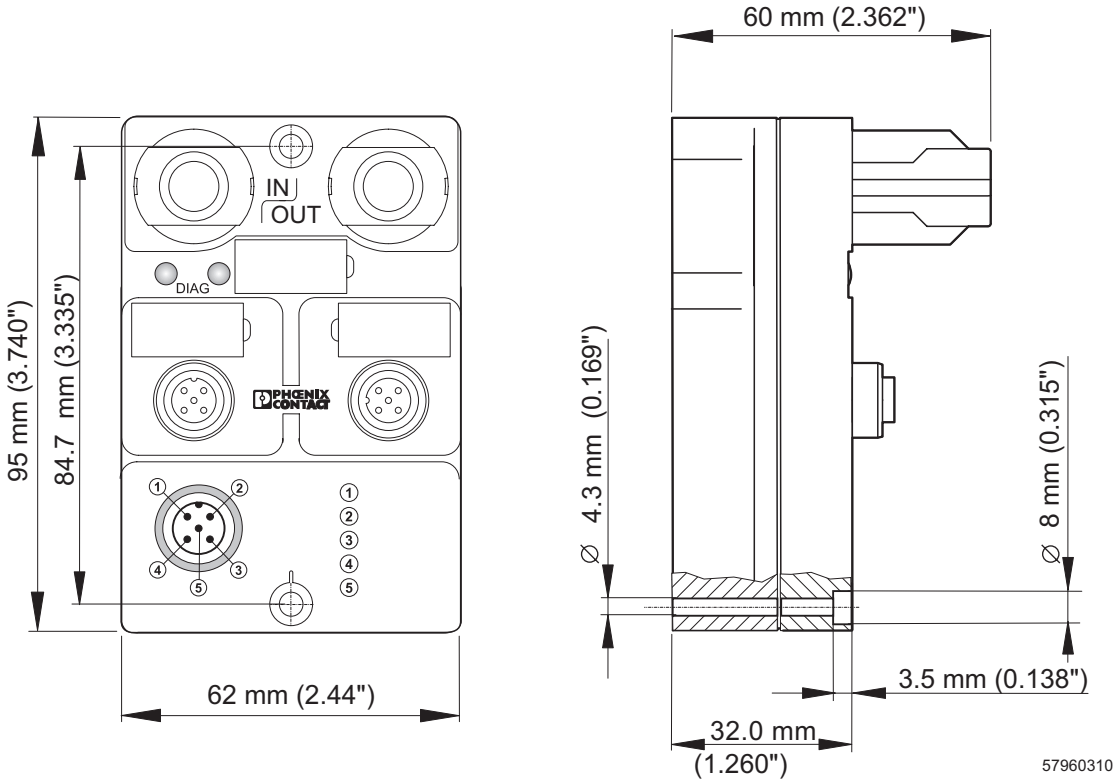


Figure 3-9 Dimensions of analog Loop 2 modules

In Figure 3-9 the housing dimensions of the following modules are shown:

- Input module with two analog inputs
- Output module with one analog output
- Input module for two temperature sensors

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.2.4 Dimensions of the Loop 2 Motor Starter

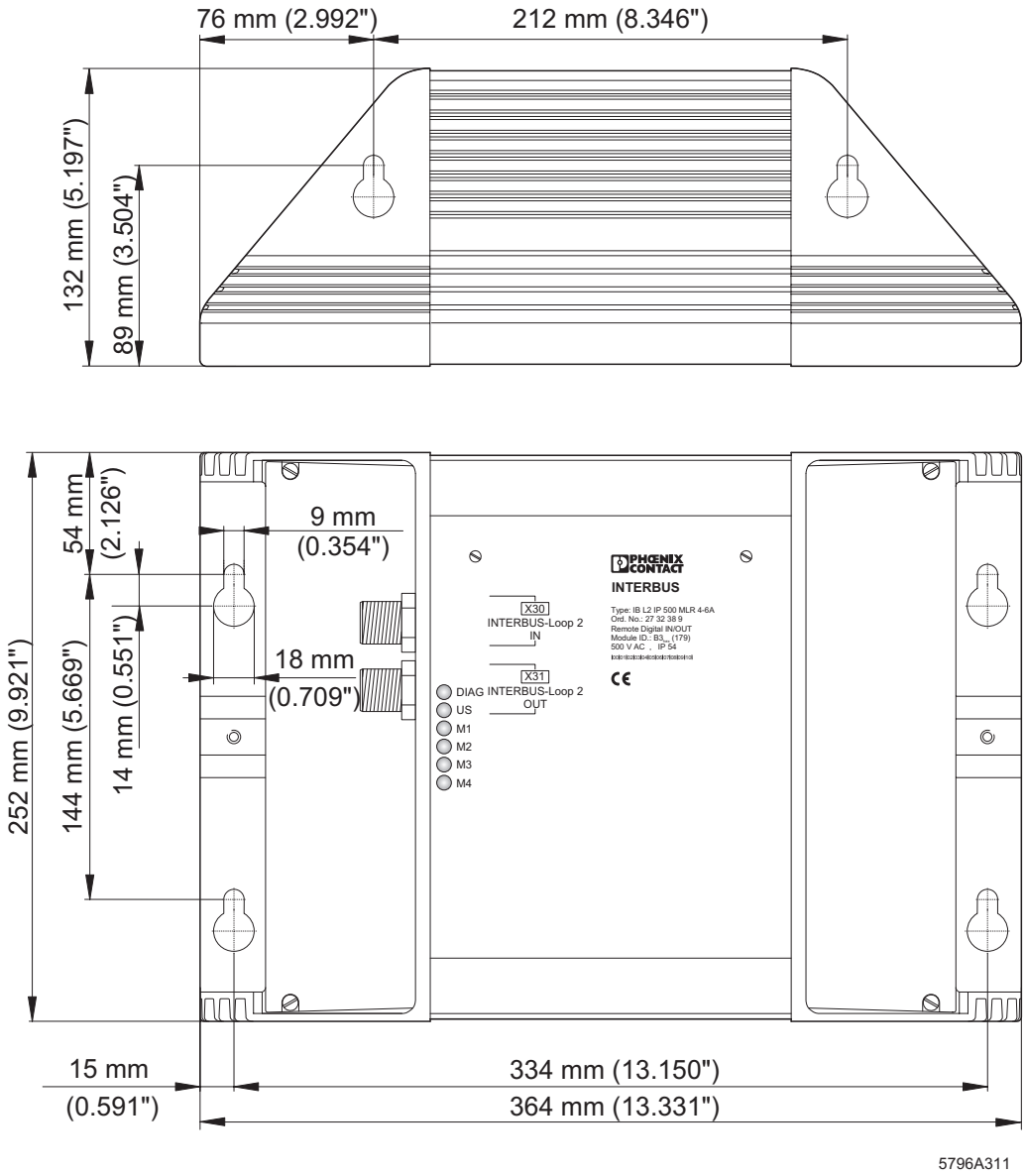


Figure 3-10 Dimensions of the Loop 2 motor starter

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.2.5 Dimensions of the S-Line Modules

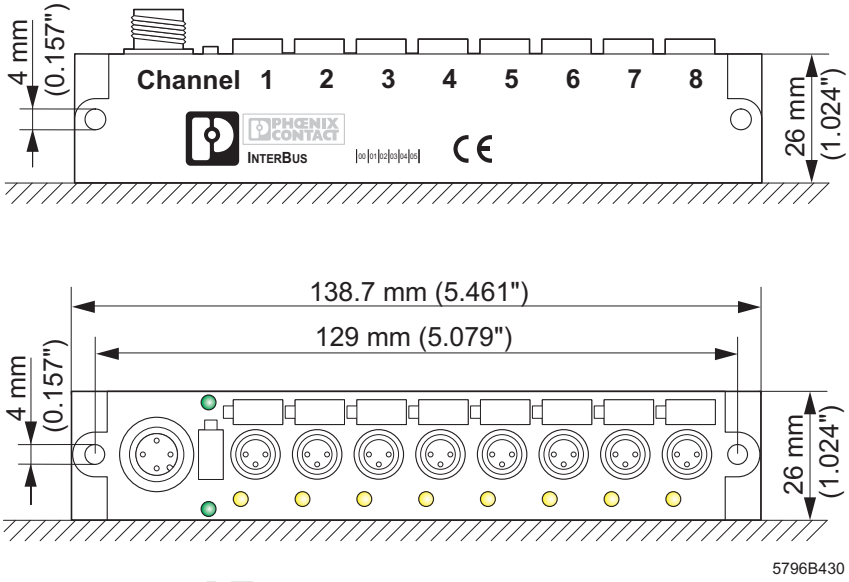


Figure 3-11 Dimensions of the S-Line modules with eight connections

In Figure 3-11 the housing dimensions of the following modules are shown:

– I/O module with four digital inputs and four digital outputs
– Output module with eight digital outputs
– Input module with eight digital inputs

The housing dimensions are the same for the

– ADAP box

online.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

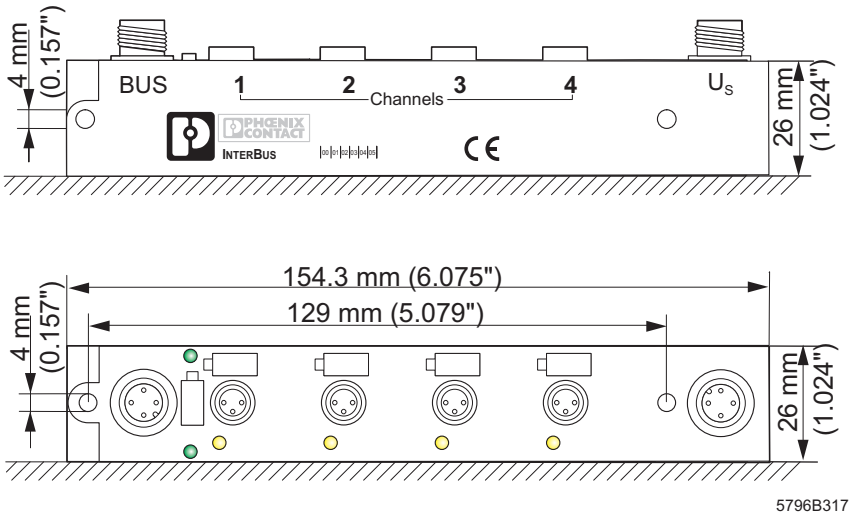


Figure 3-12 Dimensions of the S-Line modules with four connections

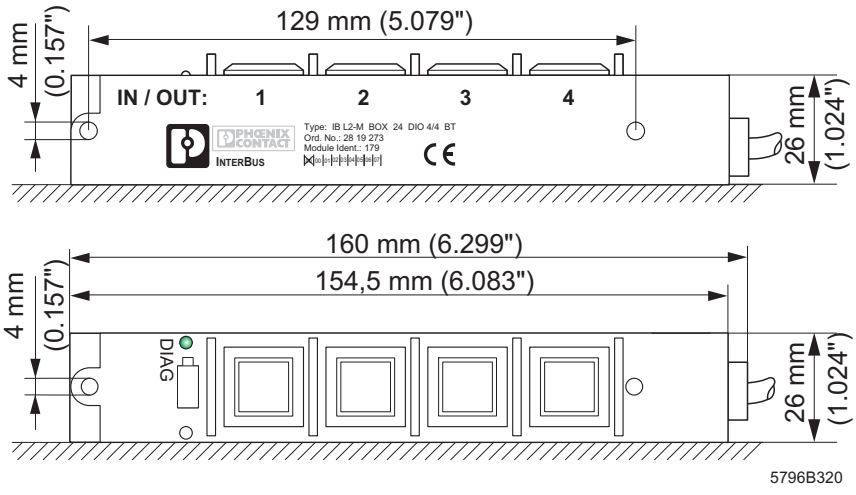


Figure 3-13 Dimensions of the S-Line modules with four illuminated pushbuttons

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.2.6 Dimensions of the Twin Box

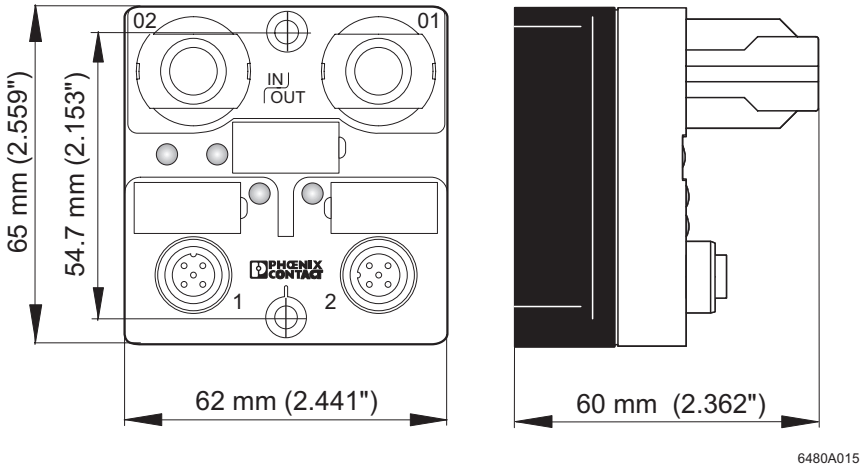
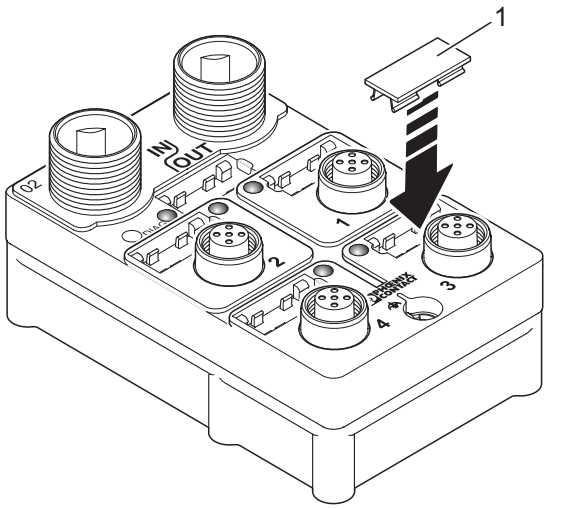


Figure 3-14 Dimensions of the twin box

onlinecomponents

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.3 Labeling of I/O Modules



5796B305

Figure 3-15 Labeling of I/O modules

The labeling plates (1) are not supplied as standard. See “Ordering Data for Loop 2 Accessories”on page 7-4.

Different labeling plates are required for S-Line modules See “Ordering Data S-Line Accessories”on page 7-5.

The I/O modules can be labeled in several places on the module housing (see Figure 3-15). In this example, a digital input module with four inputs is labeled.

How to proceed

Follow these steps when labeling:

- Take the labeling plate and snap it into one of the recesses provided.
- If you want to change the labeling plate, it can be removed using a small screwdriver.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4 Diagnostic and Status Indicators

For quick local error diagnostics, the modules have diagnostic and status indicators. They are installed clearly on the surface of the module.

Diagnostics

The diagnostic indicators are red and green LEDs. The module is functioning correctly if all of the green LEDs are on.

If an error occurs, the green diagnostic LED of a module flashes (see the following pages).

Once errors have been removed, the indicators immediately display the current status.

If the error cause is undervoltage, this error must be removed and then reset at the master. The indicators on the Loop 2 modules then indicate the current status again.

For further information on diagnostics, please refer to the Quick Start Guide IBSSYS DIAG DSC UM E, Order No. 27 47 28 0).

Status

The status LEDs (yellow) display the status of the according inputs/outputs or the connected device.

The LEDs listed below are typical for Loop 2 modules, but not all of the LEDs are on every module. Depending on the module type, additional indicators can also indicate the status of the module.

For additional information on the diagnostic and status indicators of a particular module, please refer to the module-specific data sheet.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4.1 Bus Terminal Module Indicators

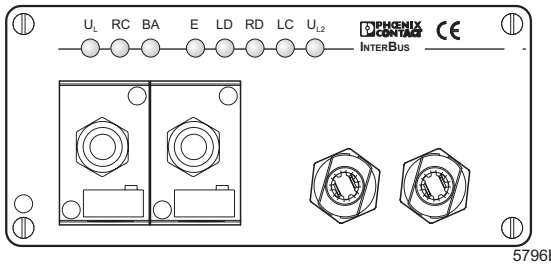


Figure 3-16 Diagnostic indicators of the bus terminal module

Diagnostics

The diagnostic indicators (red/green) provide information on the state of the module. The module is functioning correctly if all of the green LEDs are on.

UL	Green LED	Supply voltage of the module electronics
	ON:	Supply voltage in permissible tolerance zone
	OFF:	Supply voltage not present – Fuse F1 blown – Internal power supply unit for the communications voltage is defective
RC	Green LED	Remote bus connection (remote bus check)
	ON:	Incoming remote bus connection established
	OFF:	Incoming remote bus connection faulty
BA	Green LED	Bus active (remote bus active)
	ON:	Data transmission on INTERBUS active
	OFF:	No data transmission
	Flashing:	Bus active, but no cyclic data transmission
E	Red LED	This LED is reserved for future applications.
LD	Red LED	Local bus disabled
	ON:	Local bus switched off
	OFF:	Local bus switched on

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

RD	Red LED	Remote bus disabled
	ON:	Outgoing remote bus disabled
	OFF:	Outgoing remote bus switched on
LC	Green/red LED	Loop 2 active
	Green:	Loop IN receives telegrams
	Red:	Loop voltage switched off (because of short circuit/ overload etc.)
U_{L2}	Green/red LED	Loop 2 supply voltage
	Green:	Supply voltage o.k, Loop 2 circuit closed
	Red:	Supply voltage o.k, Loop 2 circuit not closed
	OFF:	Supply voltage too low or not available

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4.2 Indicators of Digital I/O Modules

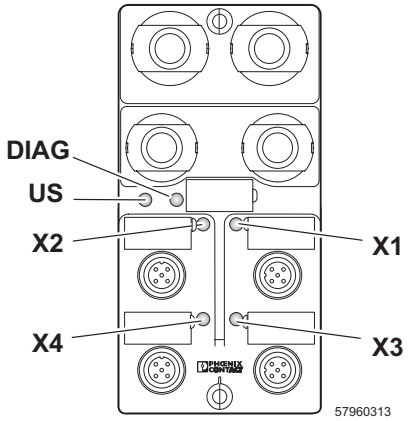


Figure 3-17 Indicators of digital I/O modules

Diagnostics

The diagnostic indicators (green) provide information on the state of the module. The module is functioning correctly if all of the green LEDs are on.

US	Green LED	Supply voltage for the actuators
	Green:	Supply voltage present
	OFF:	Supply voltage not present
DIAG	Green LED	
	Green:	Bus active
	Flashing (0.5 Hz):	Communications voltage present, bus not active
	Flashing (2 Hz):	I/O error
	Flashing (4 Hz):	Local bus error
	OFF:	Communications voltage not present

Status

The status of an input/output can be read on the corresponding yellow LED:

X(n)	Yellow LED	Status of the input/output
	ON:	Input/output active, i.e., logic state "1"
	OFF:	Input/output inactive, i.e., logic state "0"

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4.3 Indicators of the Power Module

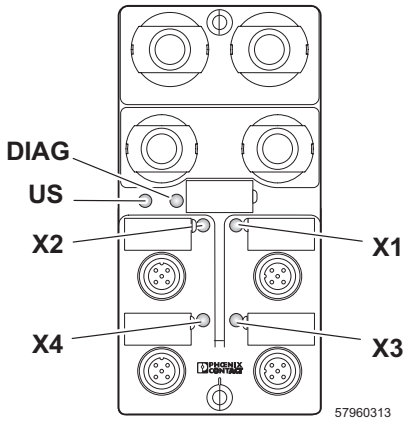


Figure 3-18 Indicators of the power module

Diagnostics

The diagnostic indicators (green/red) provide information on the state of the module. The module is functioning correctly if all of the green LEDs are on.

US	Green/red LED	Power voltage
	Green:	Power voltage present, bus voltage OUT o.k.
	Red:	Power voltage present, bus voltage OUT not present or too low
	OFF:	Power voltage not present or too low
DIAG	Green/red LED	
	Green:	Bus active
	Flashing (0.5 Hz):	Communications voltage U_L present, bus not active
	Flashing (2 Hz):	I/O error
	Flashing (4 Hz):	Local bus error
	Red:	Bus voltage overloaded

Status

The status of an input can be read on the corresponding yellow LED:

X(n)	Yellow LED	Status of the inputs
	ON:	Input active, i.e., logic state "1"
	OFF:	Input inactive, i.e., logic state "0"

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4.4 Indicators for Analog I/O Modules

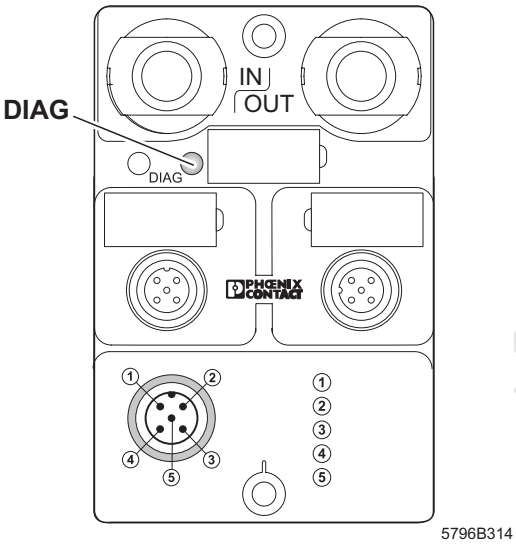


Figure 3-19 Indicators for analog I/O modules

Diagnostics

The diagnostic indicators (green) provide information on the state of the module. The module is functioning correctly if the green LED is on.

DIAG	Green LED
ON:	Bus active
Flashing (0.5 Hz):	Communications voltage present, bus not active
Flashing (2 Hz):	I/O error
Flashing (4 Hz):	Local bus error
OFF:	Communications voltage not present

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4.5 Indicators of the Loop 2 Motor Starter

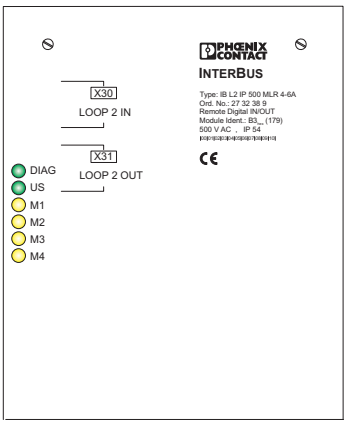


Figure 3-20 Indicators of the Loop 2 motor starter

Diagnostics

The diagnostic indicators (green) provide information on the state of the module. The module is functioning correctly if all of the green LEDs are on.

US	Green LED	Supply voltage for the actuators (power level)
	ON:	Supply voltage present
	OFF:	Supply voltage not present
DIAG	Green LED	
	ON:	Bus active
	Flashing (0.5 Hz):	Communications voltage present, bus not active
	Flashing (2 Hz):	I/O error
	Flashing (4 Hz):	Local bus error
	OFF:	Communications voltage not present

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Status

The status indicators provide information on the status of the connected devices:

M1	Yellow LED	Motor 1/motor 1 direction of rotation 1
	ON:	Motor 1 on/motor 1 direction of rotation 1 switched on
	OFF:	Motor 1 OFF/motor 1 direction of rotation 1 not switched on
M2	Yellow LED	Motor 2/motor 1 direction of rotation 2
	ON:	Motor 2 on/motor 1 direction of rotation 2 switched on
	OFF:	Motor 2 OFF/motor 1 direction of rotation 2 not switched on
M3	Yellow LED	Motor 3/motor 3 direction of rotation 1
	ON:	Motor 3 on/motor 3 direction of rotation 1 switched on
	OFF:	Motor 3 OFF/motor 3 direction of rotation 1 not switched on
M4	Yellow LED	Motor 4/motor 3 direction of rotation 2
	ON:	Motor 4 on/motor 3 direction of rotation 2 switched on
	OFF:	Motor 4 OFF/motor 3 direction of rotation 2 not switched on

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

3.4.6 Indicators of the S-Line Modules

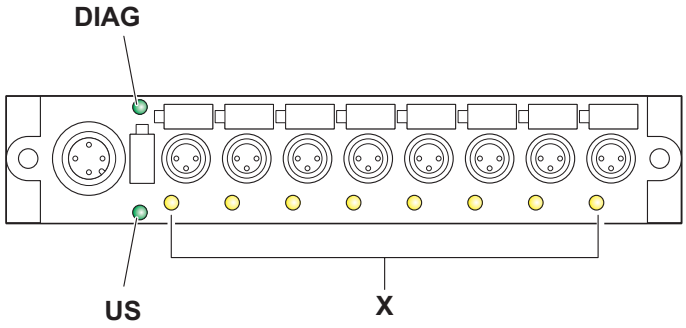


Figure 3-21 Indicators of the S-Line modules (example)

Diagnostics

The diagnostic indicators (green) provide information on the state of the module. The module is functioning correctly if all of the green LEDs are on.

DIAG	Green LED	
	ON:	Bus active
	Flashing (0.5 Hz):	Communications voltage present, bus not active
	Flashing (2 Hz):	I/O error
	Flashing (4 Hz):	Local bus error
	OFF:	Communications voltage not present
US	Green LED	Supply voltage for the actuators
	ON:	Supply voltage present
	OFF:	Supply voltage not present

Status

The status of an input or output can be read on the corresponding yellow LED:

X(n)	Yellow LED	Status of the inputs/outputs
	ON:	Input/output active, i.e., logic state "1"
	OFF:	Input/output inactive, i.e., logic state "0"

onlinecomponents

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 4

This section informs you about

– general information on the INTERBUS and Loop 2 installation
– connecting the modules and sensors/actuators
– the initial startup

Mounting and Connecting Modules 4-3

4.1 General Information on INTERBUS Installation 4-3
4.1.1 Installing Bus Lines Between Buildings 4-5
4.1.2 Interference Suppression Measures 4-7
4.2 Loop 2 Installation 4-8
4.2.1 Power Supply for the Bus Terminal Modules 4-8
4.2.2 Power Concept 4-9
4.2.3 Grounding Concept 4-11
4.3 Mounting Loop 2 Modules 4-13
4.3.1 Mounting Loop 2 Bus Terminal Modules 4-13
4.3.2 Mounting Loop 2 Modules 4-14
4.3.3 Mounting Loop 2 Motor Starters 4-14
4.4 Connecting Cables 4-15
4.4.1 Connecting Remote Bus Cables to the Bus Terminal Module 4-15
4.4.2 Connecting Loop 2 4-21
4.4.3 Connecting the Actuator Supply 4-26
4.4.4 Mounting Filler Plugs 4-30
4.5 Shielding of Analog Sensors and Actuators 4-31
4.5.1 Analog Sensors 4-31
4.5.2 Analog Actuators 4-31
4.6 Connecting Loop 2 Motor Starter 4-35
4.6.1 Connecting the Bus Cable to the Motor Starter 4-35
4.6.2 Connecting the Power Periphery 4-36
4.7 Mounting and Connecting S-Line Modules 4-42
4.7.1 Mounting the Modules 4-42
4.7.2 Assembling the Connecting Cables 4-42
4.7.3 Assembling Loop 2 M12 Cables 4-43

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.7.4 Connecting the Actuator Supply 4-46
4.8 Initial Startup 4-48
4.9 Measuring Voltage Drop 4-51
4.10 Connecting Sensors and Actuators 4-54

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4 Mounting and Connecting Modules

4.1 General Information on INTERBUS Installation

When preparing for cable installation, the local conditions and the corresponding mounting regulations are very important. Cables can for example be installed in cable ducts or on cable bridges.

A minimum distance between the cabling and possible sources of interference (e.g., machines, welding equipment, power cables) is defined in relevant regulations and standards. During planning and installation of the INTERBUS system these regulations and standards must be taken into account and observed.

Protect the bus lines from electric/magnetic interference and mechanical strain.

Note the following guidelines for "Electromagnetic Compatibility" (EMC).

Note the following guidelines to keep mechanical danger and interference as low as possible:

Mechanical strain

- Choose the correct cable type for each application (e.g., for indoor and outdoor installation, trailing chains), see "Technical Data of the Cable Types"on page 6-14.
- Make sure the bending radius does not fall below a certain value, see "Technical Data of the Cable Types"on page 6-14.
- Cables must not enter the shear area of moving machine parts.
- Do not install bus lines at right angles to driving paths and machine movements.
- Use cable ducts or cable bridges.

Interference

- Signal and power supply lines should not be installed in parallel. If necessary, metal isolating segments should be placed between the power supply and signal lines.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- Only use connectors with metal housings and connect as much of the shielding as possible to the housing.
- Refer to "Installing Bus Lines Between Buildings"on page 4-5 when grounding cables run between buildings.
- For the installation, all interlocks of the connectors (screws, cap nuts) must be firmly tightened to guarantee the best contact between shielding and ground. Before initial startup, the connection between ground and shielding must be checked for low-resistance continuity.

Routing of buses in control cabinets

- Install bus lines in separate cable ducts or separate cable bundles.
- Avoid the installation of bus lines parallel to power supply lines.
- Install bus lines with a minimum distance of 10 cm (3.937 in.) to power cables.

Routing of buses in buildings

- If possible, use metal cable hangers.
- Do not install bus lines together with or parallel to power supply lines.
- Separate bus lines on cable bridges or in cable ducts from the power supply lines using isolating segments.
- Install bus lines as far away as possible from interference sources, e.g., motors and welding equipment.
- For long line connections, install an additional equipotential bonding line between the connection points.

Routing of buses outside buildings

- Install the bus lines in metal pipes that are grounded on both sides or in concrete cable ducts with continuous reinforcement.
- For long line connections, install an additional equipotential bonding line between the connection points.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.1.1 Installing Bus Lines Between Buildings

Surge voltages

Surge voltages result from switching operations, electrostatic discharges and lightning discharges. Surge voltages inject inductively, capacitively or galvanically into the electrical lines for power supply, measured value transmission and data transmission. In this way, surge voltages reach supply units and interfaces of systems and devices.

Grounding cable shielding

Ground the cable shielding (Figure 4-1, 2) directly after it has been installed in the building to avoid surge voltages. The cable shielding must have a diameter that meets all applicable standards.

Equipotential bonding line

Install an additional equipotential bonding line between the grounding points of buildings (Figure 4-1, 3), that preferably is designed as

– A metal reinforced concrete channel
– An additional grounding cable
– A metal pipe

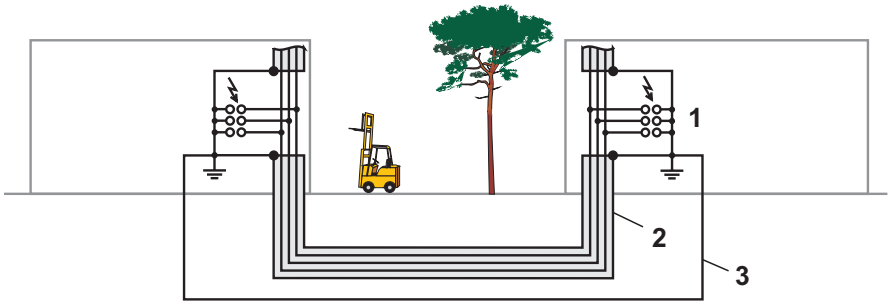
Surge voltage protection devices

Phoenix Contact recommends to connect all cable wires with surge voltage protection devices (Figure 4-1, 1) to protect the modules from surge voltages.

Make sure you follow the national and international regulations when installing the surge voltage protection devices.

online components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS



6000A202

Figure 4-1 Surge voltage protection measures

1 Surge voltage protection devices
2 Cable shielding
3 Equipotential bonding line

onlinecomponents

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.1.2 Interference Suppression Measures

Phoenix Contact recommends connecting relay coils and motor coils to an RC element, to protect the modules from interferences. Depending on the application, the delay time of the relay can be increased by approximately 1 ms.

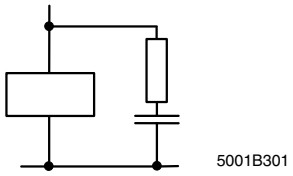


Figure 4-2 Relay coil with RC element

For the sizing of the RC element the following values are recommended:

R = 100 Ω to 200 Ω

C = 220 nF to 470 nF

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.2 Loop 2 Installation

4.2.1 Power Supply for the Bus Terminal Modules

The bus terminal module supplies communications voltage to the module electronics of the connected modules. If this supply voltage is switched off, the bus stops.

Install the voltage supply of the actuators independently of the voltage supply of the INTERBUS module electronics. Protect the voltage supplies independently.
In this way INTERBUS continues to run even if some I/O devices are switched off.

When using an emergency stop circuit, only the voltage supply of the actuators may be connected to the emergency stop circuit. Errors can then be detected by means of the sensors in the emergency stop state.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.2.2 Power Concept

As described above, the bus terminal module of a Loop 2 system provides the module electronics of the connected modules with communications voltage. The actuator supply is provided separately for the output modules. The sensor connections are supplied using the supply from the bus terminal module.

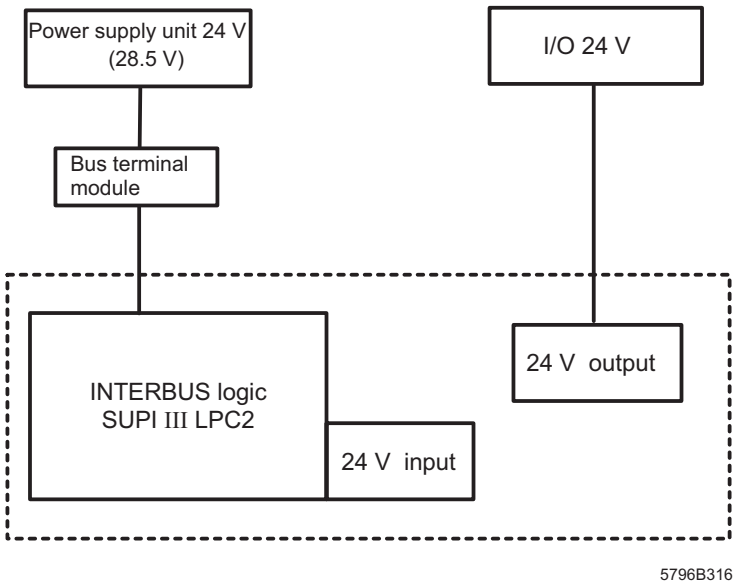


Figure 4-3 Recommended power concept

online

Please note that the bus supply and actuator supply should be electrically isolated.

Voltage drops occur at bus devices and on bus lines. In order for the Loop voltage not to fall under a value of 19.2 V (ripple included) in Loop systems with numerous devices or a large extension the bus terminal module should be supplied with 28.5 V.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Total sensor current

In addition to the module current consumption of the communications power, each input module has a total sensor current which depends on the number of connected sensors. This total sensor current and the current for the module electronics of the connected modules must not exceed 1.8 A to ensure error-free bus operation.

Power module

To enable the supply of up to 63 devices in a Loop 2 system, there is an option of using a power module (IB L2 PWR IN DI 4/4 M12) to boost the supply voltage in the Loop 2 system and thus ensure error-free bus operation.

At the power module, the voltage supply from the bus terminal module is interrupted and re-injected.

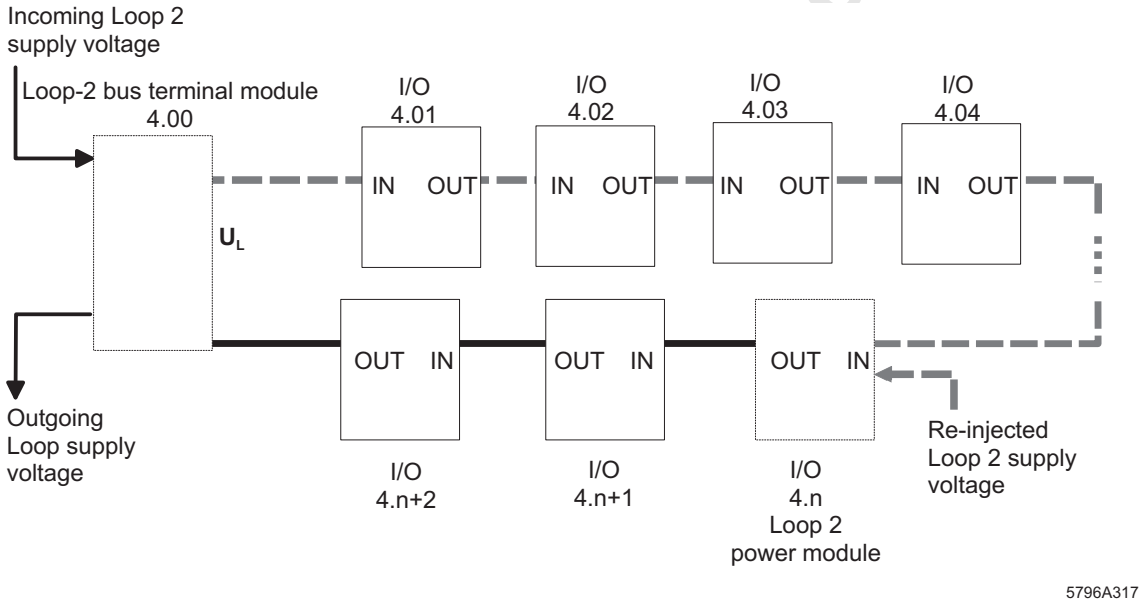


Figure 4-4 Voltage supply for a Loop 2 system with power module

When determining the supply point, please consider that the voltage is supplied opposite the data direction and the module counting method.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.2.3 Grounding Concept

Grounding protects human beings and machines from dangerous voltages. To avoid these dangers, a correct installation, taking the local conditions into account, is vital.
Ensure that the modules you are using are properly grounded before startup.

For grounding, a distinction is made between power modules (motor starters) and low-level signal modules (I/O modules).

Power modules - PE

Power modules are grounded via the PE (protective earth ground). For the Loop 2 motor starter, a PE connection is provided on the flange.

Low-level signal modules - FE

Low-level signal modules are grounded via the FE (functional earth ground).

Functional Earth Ground for S-Line Modules

Functional earth grounding on the S-Line modules is not required.

Functional Earth Ground for Loop 2 Modules

Loop 2 modules are designed for screw-mounting on a flat mounting surface (direct mounting). The FE connection of the housing can be achieved using a mounting screw on a grounded mounting surface or an outside grounding connection.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Functional Earth Ground for Digital Output/Input Modules

For modules with digital outputs and for the power module, the functional earth ground (FE) of the actuator supply/power voltage has no internal connection to the functional earth ground (FE) of the mounting screw.
The module can only be connected to (FE) via the mounting screw.

The FE line of the actuator supply/power voltage is jumpered between the two actuator supply/power voltage interfaces (03 and 04) (see Figure 4-5).

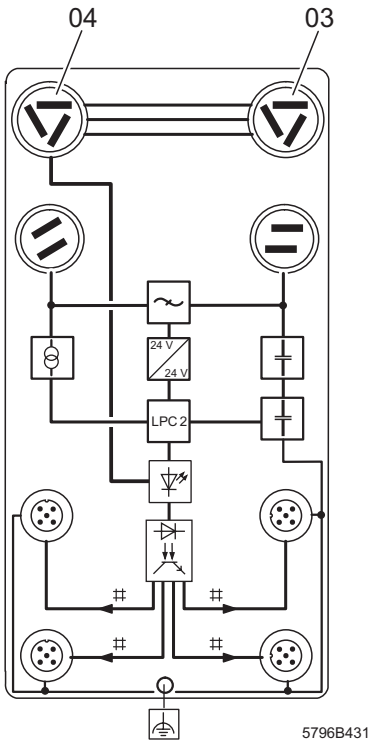


Figure 4-5 Jumpered FE line on the digital output module

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.3 Mounting Loop 2 Modules

4.3.1 Mounting Loop 2 Bus Terminal Modules

The bus terminal module is screwed directly onto a flat mounting surface.

The mounting surface must be flat to avoid strain in the housing when tightening the screws.

Functional earth ground

When mounting the bus terminal module directly, the module is grounded with the lower mounting screw (see Figure 3-1 on page 3-3). Make sure that the mounting angle section or mounting plate is grounded.

Additional grounding

The M4 bore hole on the left housing side panel (sectional view A-A in Figure 3-6 on page 3-8) is provided for an additional FE connection.

This additional grounding is required for error-free operation

Mounting position

The bus terminal module can be mounted in any position.

Mounting

Mount the module with the two M4 hexagonal socket-head screws that are part of the housing. The drill hole distance can be found in the dimensional drawing ("Dimensions of the bus terminal module"on page 3-8).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.3.2 Mounting Loop 2 Modules

Loop 2 modules are mounted directly on a flat mounting surface.

The mounting surface must be flat to avoid strain in the housing when tightening the screws.

Functional earth ground

When mounting the module directly, the module is grounded with the lower mounting screw (see Figure 3-2 on page 3-4). Make sure that the mounting angle section or mounting plate is grounded.

Mounting

You can directly mount the modules on the mounting surface, or on mounting profiles, through two mounting holes (∅ 4 mm [0.157 in.], cylindrical sinking 8 mm [0.315 in.]). The drill hole distance can be found in the dimensional drawings in Figure 3-7 on page 3-9, Figure 3-8 and Figure 3-9 on the pages 3-10 and 3-11.

4.3.3 Mounting Loop 2 Motor Starters

The motor starter is designed for wall mounting.

Screw the module directly onto a flat mounting surface. The drill hole distance can be found in Figure 3-10 on page 3-12.

Mounting position

The motor starter can be mounted in any position.

Grounding

Ground the motor starter via the equipotential bonding on the flange of the housing.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.4 Connecting Cables

4.4.1 Connecting Remote Bus Cables to the Bus Terminal Module

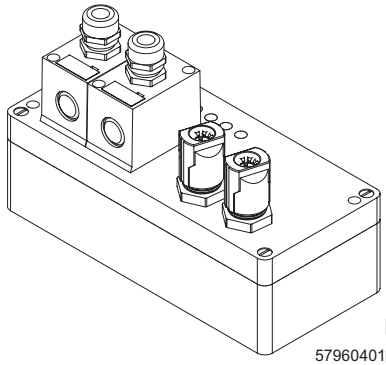


Figure 4-6 Loop 2 bus terminal module

Preparing SAB Connector Hoods

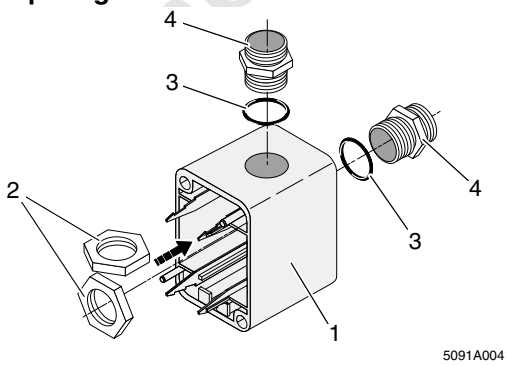


Figure 4-7 Fitting the threaded joints

The connector hoods and their accessories are supplied with the module.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- Use a screwdriver to break the cable openings out of the connector hood (1). One opening is required for the remote bus connection or installation remote bus connection, another opening is required if a separate supply voltage is to be connected.
- Push the O-ring (3) onto the threaded joint (4).
- Place the hexagonal metal nut (2) of the PG-threaded joint in the recess or in the slot of the connector hood (1).
- Tighten the cable gland until the end by turning the threaded joint (4) with a wrench (17 mm [0.669 in.]).

Assembling a Cable and Leading It Through the Connector Hood

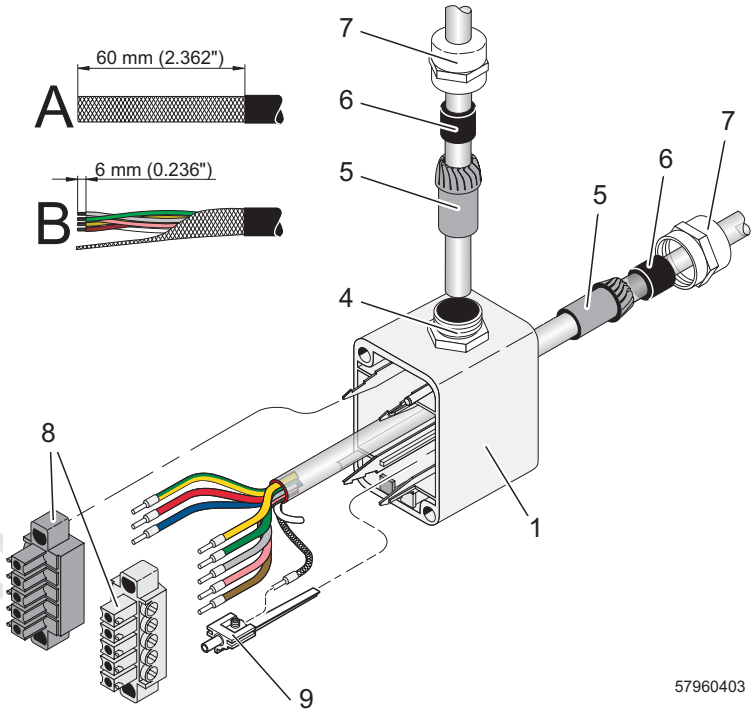


Figure 4-8 Assembling the components of the connector hood

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- Push the following parts onto the cable:
  cap (7), flexible ring (6), strain relief (5),
  connector hood with the threaded joint (1 and 4)

Refer to the description "Mounting Strain Relief"on page 4-19.

- Strip 60 mm (2.362 in.) off the outer cable sheath (A).
- Remove the braided shield from the wires and twist as much of it as possible together to form one wire (B).
- Cut off the white wire close to the outer cable sheath, as it is not required.
- Crimp a ferrule to the end of the wire consisting of braided shield. Connect the ferrule to the shielding contact (9).
- Strip 6 mm (0.236 in.) off the conductor ends and fit ferrules at the ends.
- Push the wires into the contacts of the MINI-COMBICON connector.
- Secure the wires in the contacts by tightening the screws.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Wiring MINI-COMBICON Connectors

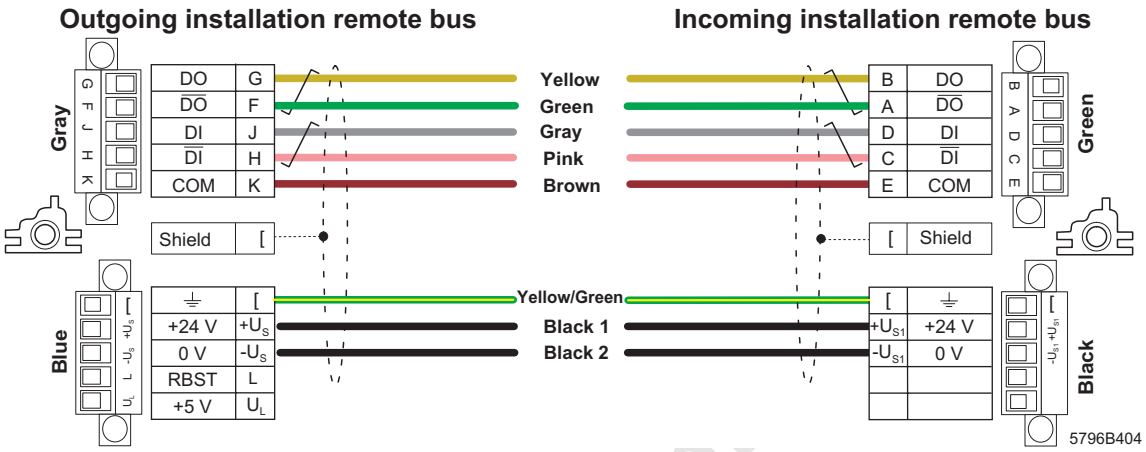


Figure 4-9 MINI-COMBICON pin assignment (installation remote bus)

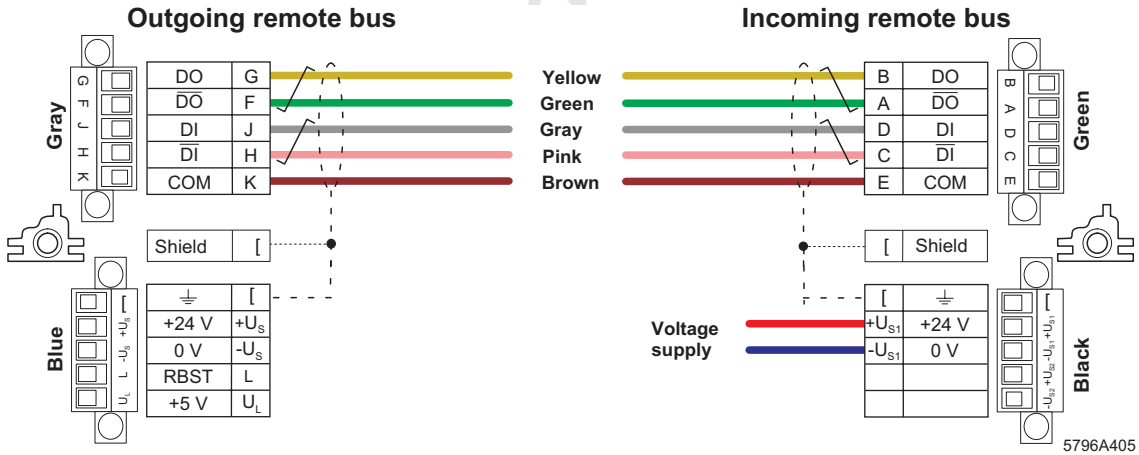


Figure 4-10 MINI-COMBICON pin assignment (remote bus)

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Mounting Strain Relief

Ensure the tightness of the connector hood opening to guarantee IP 65/ IP 67 protection of the module.

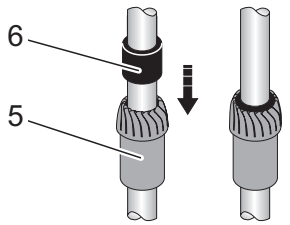


Figure 4-11 Strain relief and flexible ring

- Push the flexible ring (6) into the strain relief (5).
- Push the strain relief (5) into the threaded joint (4) (see Figure 4-8).
- Pull the cable back so that the outer cable sheath is still visible from the inside of the connector hood.
- Fasten the cap (7) onto the threaded joint (4) by turning the cap with a wrench (17 mm (0.669 in.]) (see Figure 4-8).

Placing the Connector Hoods

Avoid damage to the module electronics!

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Do not mix up the terminals, as this may damage the electronics.

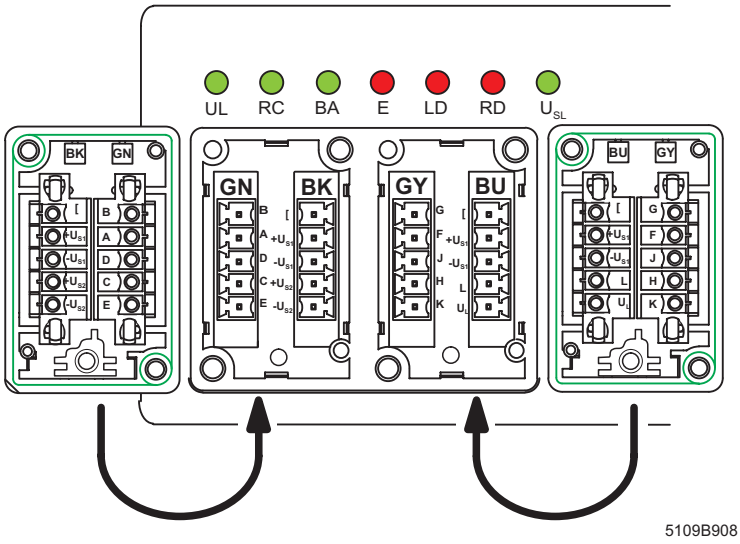


Figure 4-12 Placing the connector hoods

Table 4-1 Color assignment of the MINI-COMBICON connector

INTERBUS IN		INTERBUS OUT	
Green	GN	Gray	GY
Black	BK	Blue	BU

- Push the shielding contact into the connector hood using the rails provided for it.
- Snap the wired MINI-COMBICON connectors according to the color coding onto the locking clips.
- Fasten the connector hoods with the supplied screws.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.4.2 Connecting Loop 2

To connect Loop 2, use a two-wire Loop cable.

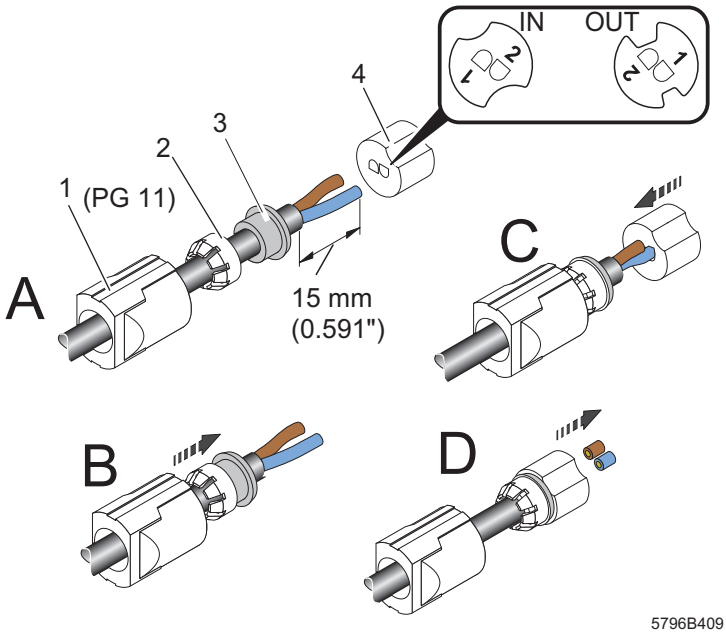


Figure 4-13 Connecting Loop 2 using the QUICKON connection method

1 Green cap nut
2 Compression ring
3 Grommet
4 2-pos. splice ring

onlinecomponents.com

The connector set includes various cap nuts. Ensure you select the correct individual parts for assembling the cable. The cap nuts (Loop 2/actuator supply) are of different colors: The cap nut for Loop 2 is green, the cap nut for the actuator supply is black.

Assembling the cable

- Push the cap nut (1), the compression ring (2) and the grommet (3) onto the cable (Figure 4-13, A).
- Strip approximately 15 mm (0.591 in.) off the outer cable sheath.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- First push the grommet to the end of the cable sheath, then push the compression ring onto the grommet. This provides the strain relief for the cable (Figure 4-13, B).
- Insert the wire ends into the corresponding splice ring openings (4) (Figure 4-13, C).

To ensure that the + and - signals are not mixed up, the splice ring openings are marked 1 and 2.

Table 4-2 Pin assignment of the splice ring

2-Pos. Splice Ring		
Labeling	**Signal**	**Wire Color**
1	+	Brown
2	-	Blue

Mixing up the polarity (+ and -) of the Loop cable between standard modules does not affect the function. However, the splice rings are marked 1 and 2 so that they cannot be mixed up for special modules.

- Cut off the protruding wire ends (Figure 4-13, D).
  Ensure that the wire ends are flush with the splice ring; they must neither protrude nor be too short.
- Attach the assembled cable to the appropriate connector on the module.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Mounting QUICKON

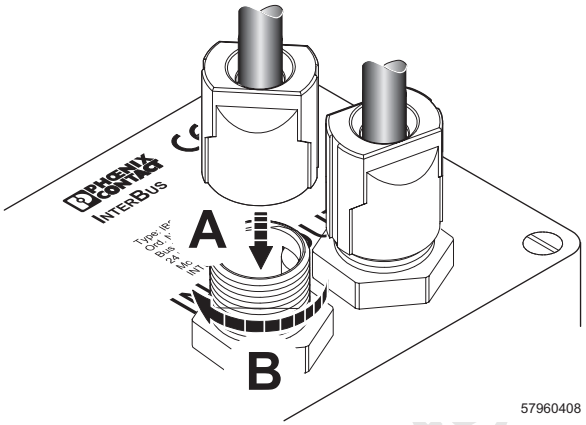


Figure 4-14 Mounting QUICKON on the bus terminal module

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

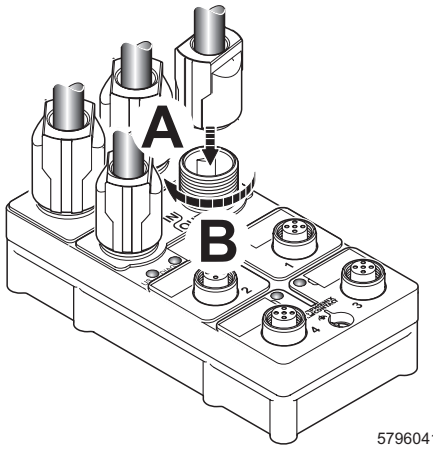


Figure 4-15 Mounting QUICKON on I/O modules

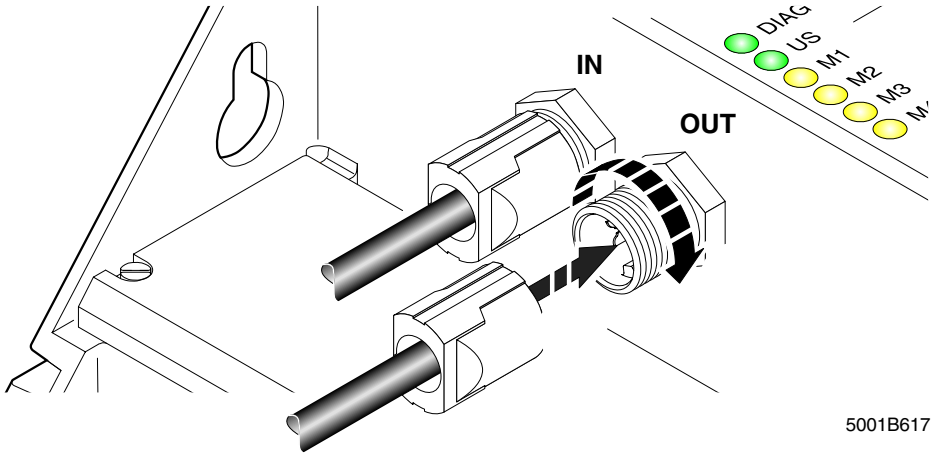


Figure 4-16 Mounting QUICKON on motor starters

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

If the Loop IN and Loop OUT lines are mixed up, Loop 2 will not operate correctly. The red LD LED of the bus terminal module is on. That means that the I/O modules of the local bus are disconnected.

To avoid mixing up IN and OUT connections, the splice ring keying for the incoming Loop 2 (IN) is circular and the splice ring keying for the outgoing Loop 2 (OUT) is square (see Figure 4-13, C).

- Turn the assembled cable until the coding tabs fit exactly into the guideways.
- Tighten the threaded joint by turning the cap nut. The insulation is cut open and the electrical contact is established (QUICKON connection method).

QUICKON connections can be tightened manually or with a wrench. Please note that only a small torque is required when using a wrench (1.8 Nm for the electrical contact, the maximum value is 2.2 Nm).

After removing a QUICKON connection you must cut off the slit open wires and repeat the assembly steps before making a new connection.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.4.3 Connecting the Actuator Supply

For modules with digital outputs the actuator supply is provided via a 3-wire cable (Figure 4-17, A).

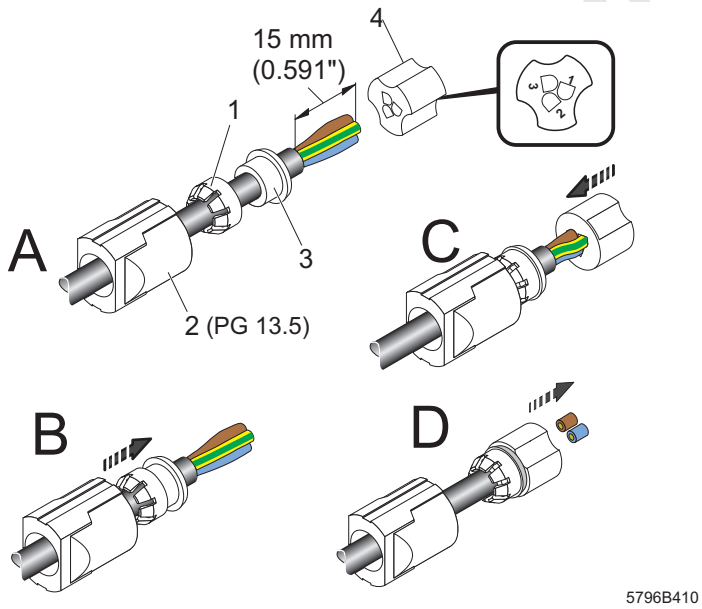


Figure 4-17 Assembling the connecting cable using the QUICKON connection method

1 Compression ring
2 Black cap nut
3 Grommet
4 3-pos. splice ring

The connector set includes various cap nuts. Ensure you select the correct individual parts for assembling the cable. The cap nuts (Loop 2/actuator supply) are of different colors: The cap nut for Loop 2 is green, the cap nut for the actuator supply is black.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Assembling the cable

The assembly steps are identical for two-wire and three-wire cables.

- Push the cap nut (1), the compression ring (2) and the grommet (3) onto the cable (Figure 4-17, A).
- Strip approximately 15 mm (0.591 in.) off the outer cable sheath.
- First push the grommet to the end of the cable sheath, then push the compression ring onto the grommet. This provides the strain relief for the cable (Figure 4-17, B).

Ensure that you use the correct splice ring for the three-wire connecting cable.

- Insert the wire ends into the corresponding splice ring openings (Figure 4-17, C).

Note the marking on the splice rings (labeled 1, 2 and 3) to prevent polarity reversal.

The protection against polarity reversal at the actuator supply is implemented via a diode with an external fuse. To guarantee protection against polarity reversal, the short circuit current of the power supply unit must be at least four times the nominal current of the fuse.

Table 4-3 Pin assignment of the splice ring

3-Pos. Splice Ring		
Labeling	**Signal**	**Wire Color**
1	+	Brown
2	-	Blue
3	FE	Green/ yellow

- Cut off the protruding wire ends.
  Ensure that the wire ends are flush with the splice ring; they must neither protrude nor be too short (Figure 4-17, D).
- Attach the assembled cable to the appropriate connector on the module (Figure 4-18, A).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Mounting QUICKON

Mixing up IN and OUT when the actuator supply is connected has no effect, which means that the splice ring for both connections has the same keying (see Figure 4-17 on page 4-26).

- Turn the assembled cable until the coding tabs fit exactly into the guideways.
- Tighten the threaded joint by turning the cap nut (Figure 4-18, B). The insulation is cut open and the electrical contact is established (QUICKON connection method).

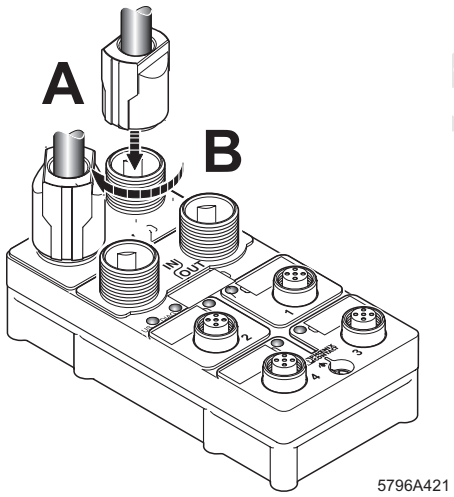


Figure 4-18 Mounting the connecting cable

QUICKON connections can be tightened manually or with a wrench. Please note that only a small torque is required when using a wrench (1.8 Nm for the electrical contact, the maximum value is 2.2 Nm).

After removing a QUICKON connection you must cut off the slit open wires and repeat the assembly steps before making a new connection.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Cover Unused Connections

- Cover the unused connections for the actuator supply with filler plugs and screw down the cap nut to ensure the level of protection for the module (see "Mounting Filler Plugs"on page 4-30).
- Cover unused actuator sockets with protective caps (accessories) to ensure the level of protection for the module.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.4.4 Mounting Filler Plugs

Cover the unused connections for the actuator supply with filler plugs and tighten the cap nut to ensure the level of protection for the module.

.

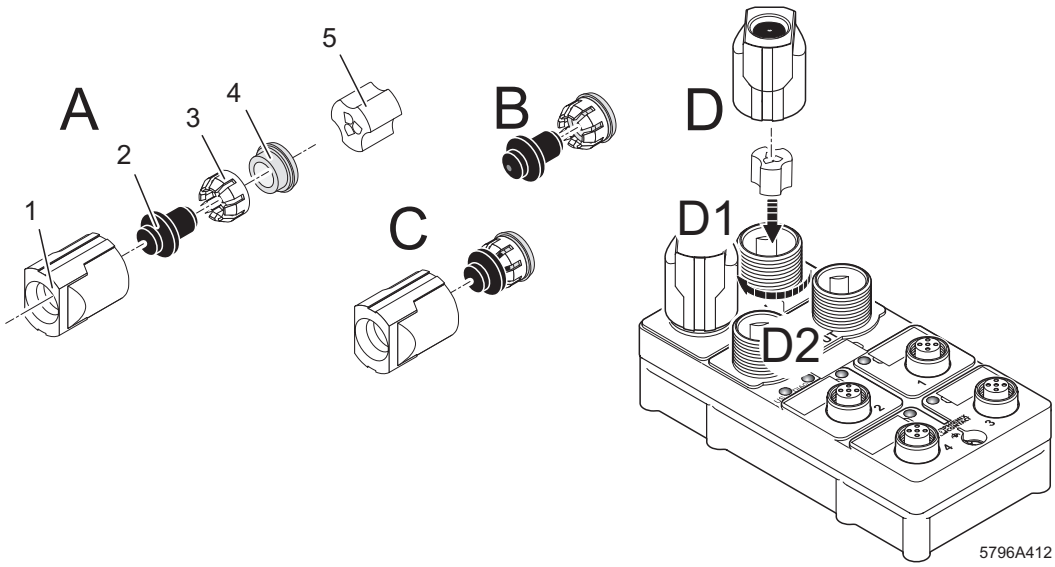


Figure 4-19 Mounting filler plugs

1 Black cap nut
2 Filler plug
3 Compression ring
4 Grommet
5 3-pos. splice ring

Assembly steps

- Push the compression ring (1) onto the grommet (4) and then attach both parts to the filler plug (2) (Figure 4-19, B).
- Once assembled, push these into the cap nut (1) (Figure 4-19, C).
- Place the splice ring in the unused socket (e.g., for the outgoing actuator supply). Attach the threaded joint with the assembled filler plugs (Figure 4-19, D1) and tighten the cap nut (Figure 4-19, D2).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.5 Shielding of Analog Sensors and Actuators

The maximum line length for connecting sensors and actuators is 30 m (98.43 ft.).

4.5.1 Analog Sensors

- Always connect analog sensors using shielded, twisted-pair cables.
- For use in environments with heavy noise Phoenix Contact recommends using the IB L2 SHIELD shield plate (supplied as standard).

To prevent compensating currents from flowing over the shield, connect the shield on the module to ground potential at only one point.

4.5.2 Analog Actuators

–

- Always connect analog actuators using twisted-pair cables.
- For use of the module in environments with extremely heavy noise, use shielded, twisted-pair cables and the IB L2 SHIELD shield plate (see "Ordering Data for Loop 2 Accessories"on page 7-4).

  Shield plate installation and grounding is shown in Figure 4-20.

To prevent compensating currents from flowing over the shield, connect the shield on the module to ground potential at only one point.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 4-4 Shield connection of analog sensors/actuators

Module Type	Connection to the Module	Connection to the Sensor/ Actuator
Analog input module	Use shield plate	Twisted-pair shielded cables
Analog input module for temperature measurement	Use shield plate	Twisted-pair shielded cables
Analog output module	Shielding only required in environments with heavy noise	Twisted-pair cables

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Connecting Shield Plate on Modules for Analog Signals

The analog input module is already equipped with the shield plate upon delivery.

For analog output modules the shield plate is required in environments with extremely heavy noise. To snap on the shield plate, proceed as shown in Figure 4-20, A and B.

You have two options for grounding the shield plate (Figure 4-20, C1 or C2):

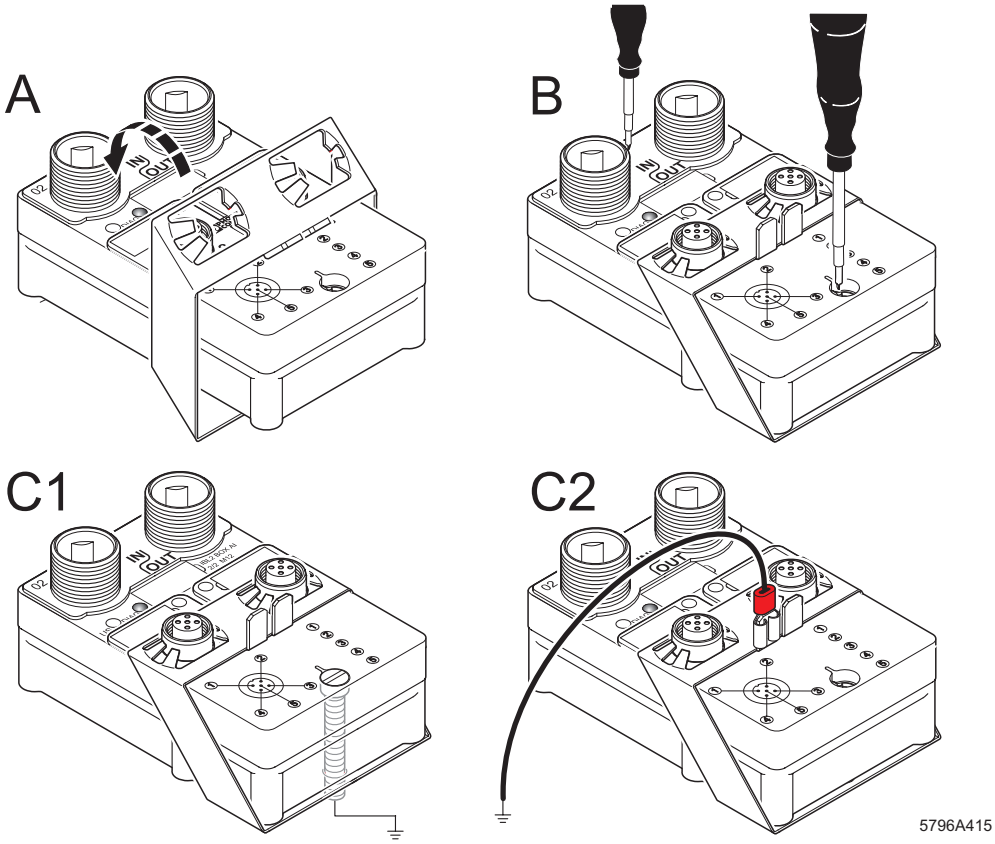


Figure 4-20 Connecting the shield plate for analog modules

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- Before placing the module on the mounting plate, snap the shield plate onto the module.
- Push the shield plate over the module (Figure 4-20, A).
- Push the shield plate over the M12 sockets (Figure 4-20, B).
- Install the module on a grounded mounting plate. The shield plate is automatically grounded (Figure 4-20, C1).

If it is not possible to fasten the module on a grounded mounting plate, connect the shield plate with a grounding point by means of a separate cable (Figure 4-20, C2). Use a cable lug to connect the cable with the shield plate.

Danger of Creating Ground Loops

The shielding must only be directly connected with the ground potential at one point.

Connect the sensor with shielded sensor cable and M12 metal connector.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.6 Connecting Loop 2 Motor Starter

4.6.1 Connecting the Bus Cable to the Motor Starter

Dangerous Voltage

Before working on the motor starter, disconnect the line voltage and ensure that it cannot be switched on again.

The IB L2 IP 500 MLR 4-6A motor starter is integrated into Loop 2 using the QUICKON connection method.

For the assembly of the Loop cable using QUICKON and its connection to the motor starter, refer to Section "Connecting Loop 2" on page 4-21.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.6.2 Connecting the Power Periphery

Dangerous Voltage

Before working on the module or system, disconnect the line voltage and ensure that it cannot be switched on again!

If these instructions are not followed, there is a danger of damage to health or even of a life-threatening injury.

The power periphery is connected by means of POWER-COMBICON. The female connectors are located under a cover in the terminal connection compartments of the module.

The connector pin assignment of the MINI- and POWER-COMBICON connectors is specified in the module-specific data sheet.

Connecting the Cables in the Terminal Connection Compartments

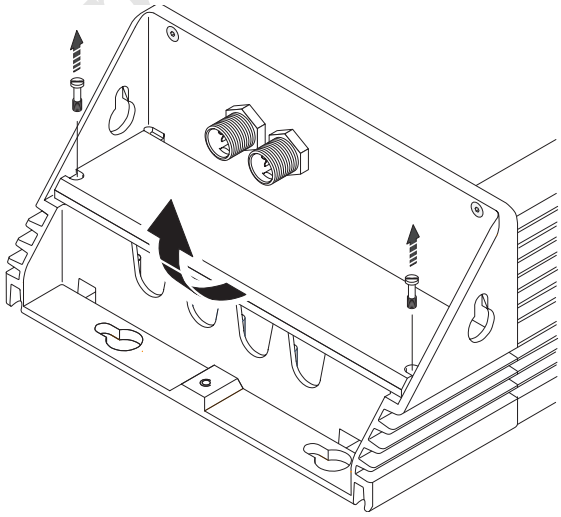


Figure 4-21 Removing the terminal strip cover

- Loosen the two screws of the terminal strip cover and remove the cover.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

In the terminal connection compartments you can connect motor, line, thermistor and supply voltage.

The connector assembly shown uses the example of a cable for a motor with PTC connection. Proceed in the same way when you assemble other cables.

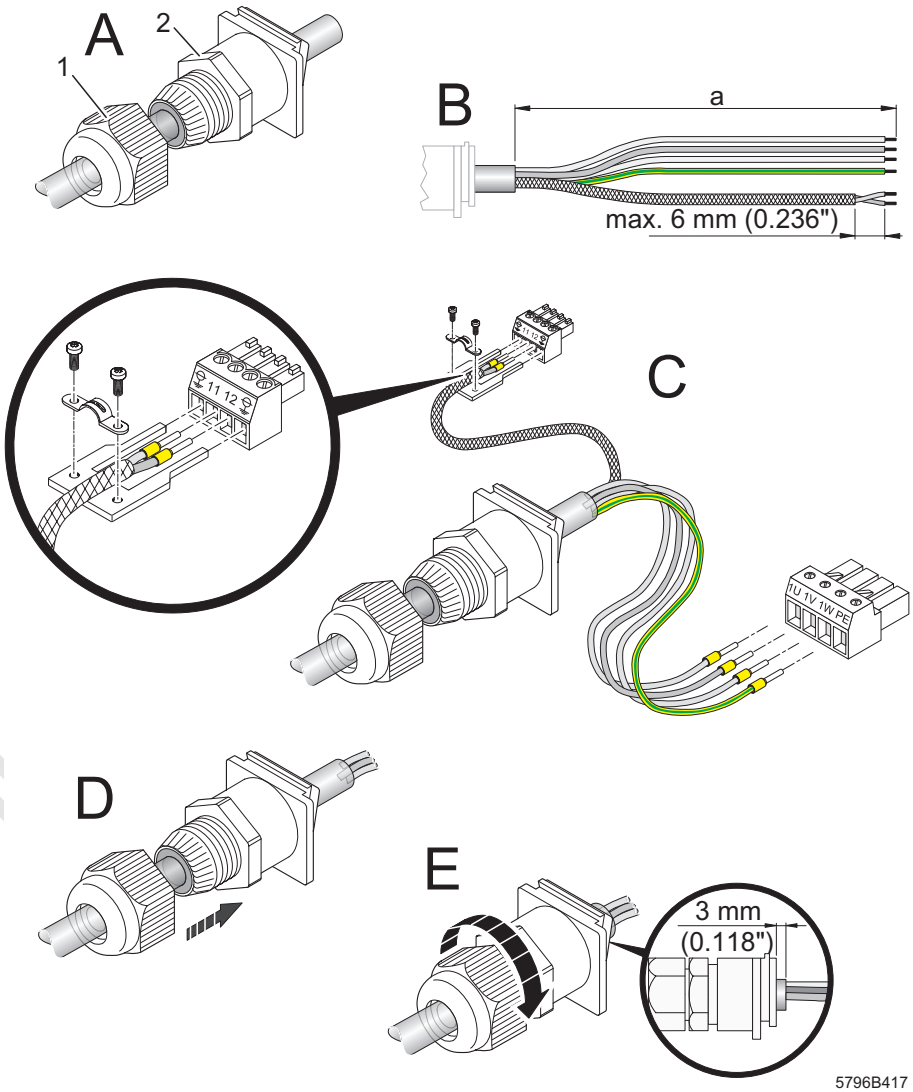


Figure 4-22 Basic assembly of the cables in the terminal connection compartments

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Note that POWER-COMBICON connectors, MINI-COMBICON connectors and PG-threaded joints with filler plugs are not supplied as standard. You may order these accessories as a connector set (see "Ordering Data"on page 7-3).

- Push the cable through the thrust nut (1) and the basic unit (2) of the PG-threaded joint (Figure 4-22A).
- Strip off the outer cable sheath according to your needs (Figure 4-22, B). The stripping length (a) depends on the opening through which you want to lay the cable, whether you want to wire a PTC, and how much cable you want to have in the terminal connection compartment.
- Strip off the conductors and fit them with ferrules. The stripping length also depends on the wire cross section used and the required ferrules.
- For PTC connections only: Shorten the shielding by maximum 6 mm (0.236 in.)
- Wire the connectors according to the tables in the module-specific data sheet (Figure 4-22, C).
- For PTC connections only: Install the shield clamp. The braided shield must be securely placed under the clamp. This ensures both the required contact and the strain relief.
- Push the basic unit of the PG-threaded joint to within approximately 3 mm (0.118 in.) of the insulation (Figure 4-22, D and E). Tighten the PG-threaded joint by turning the cap nut.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

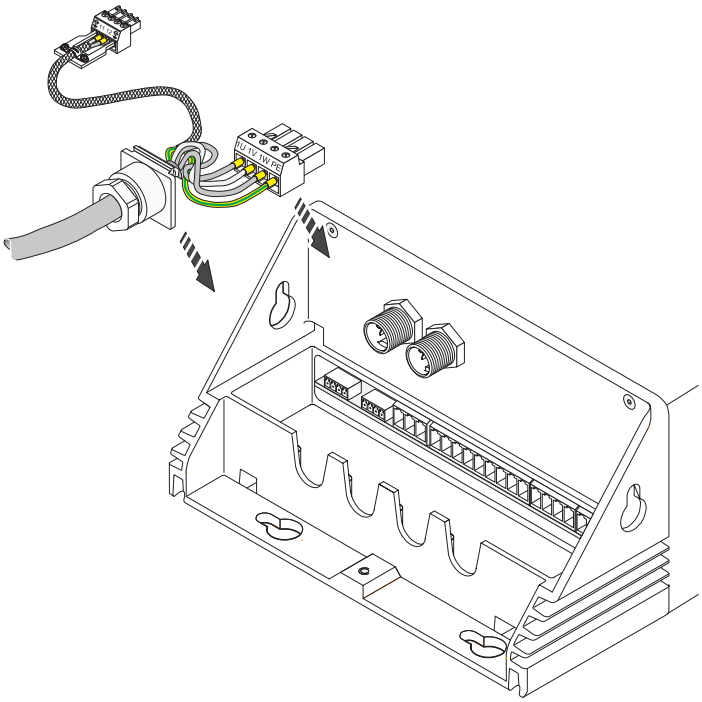


Figure 4-23 Example of connecting a motor and its PTC connection

- Plug the connector into the corresponding terminal strip so that the coding tabs match and push the PG-threaded joint into the associated recess (see Figure 4-24).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

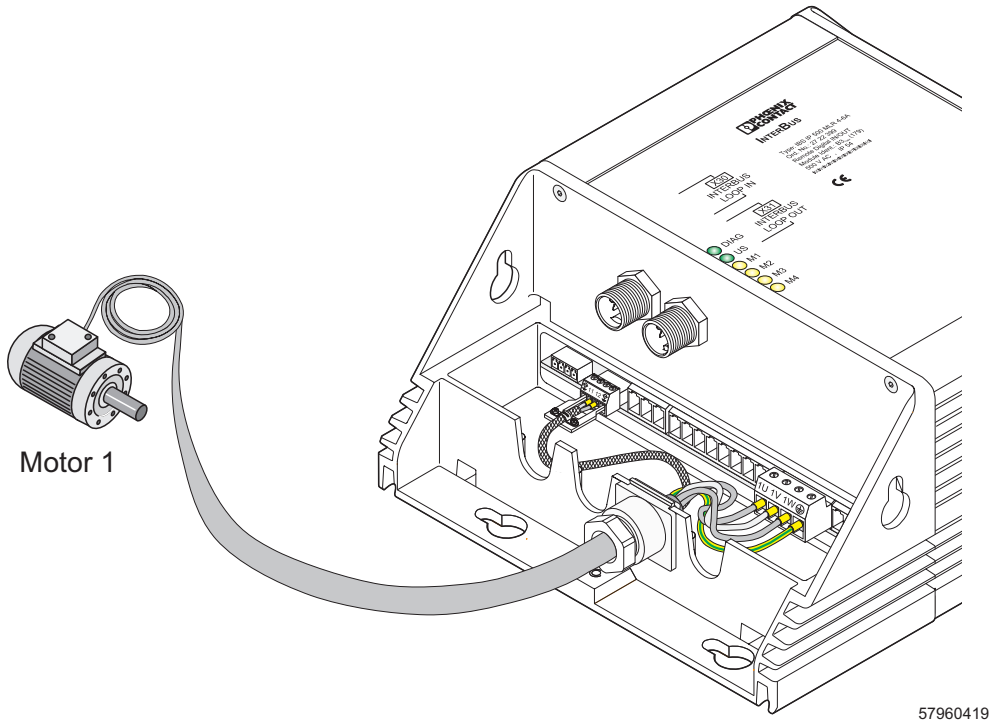


Figure 4-24 Motor and PTC connection are connected

onlinecomponents

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- Once you have occupied all of the desired terminal strips, connect the PE cable (1) to the terminal strip cover (2) via the terminal connection compartment.

To ensure IP 54 protection, put PG-threaded joints with filler plugs into unused cable openings.

- After having installed all PG-threaded joints, close the terminal connection compartment by tightening the supplied screws.

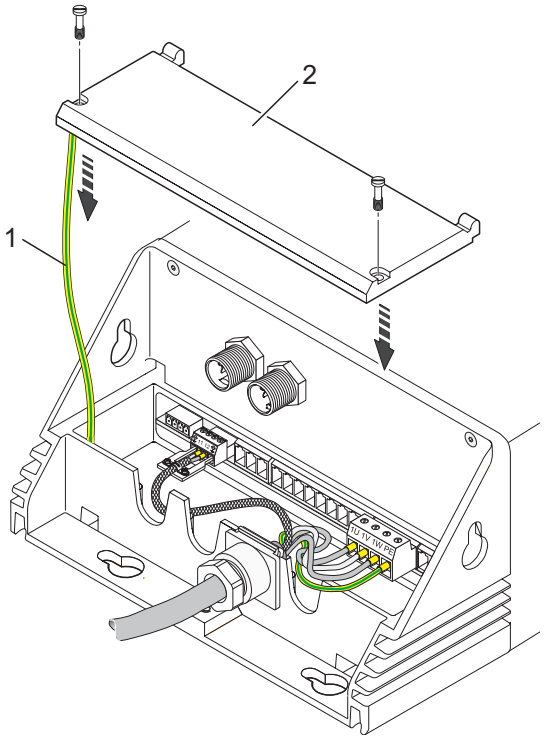


Figure 4-25 Mounting the terminal strip cover

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.7 Mounting and Connecting S-Line Modules

4.7.1 Mounting the Modules

S-Line modules can either be screwed on an even grounded mounting surface or on a machine profile.

Directly on a mounting surface

- When mounting on a mounting surface use screws as for example SACB-M4x35, Order No. 16 95 47 2.
- The bottom or the side can be the mounting surface.

On a machine profile

- When mounting on a machine profile use the SACB-HMB 10-M4 hammer slot, Order No. 16 95 46 9.

4.7.2 Assembling the Connecting Cables

Loop 2 M12

Loop 2 M12 is connected to the M12 connector.

- Connect the bus using a preassembled and tested Loop 2 M12 cable (see "Ordering Data S-Line Accessories"on page 7-5).
  or assemble the cables yourself (see "Assembling Loop 2 M12 Cables"on page 4-43).
- Push the M12 socket into the connection and tighten.

Digital inputs/ outputs M8

The sensors/actuators are directly connected to the M8 sockets using a cable with M8 connectors.

- Connect the I/O using a sensor/actuator cable, e.g.,
  Order No. 16 81 78 7.
- Push the M8 connector into the connection and tighten.

Make sure that all M8 and M12 connections are securely tightened.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.7.3 Assembling Loop 2 M12 Cables

We recommend using preassembled cables to keep error sources to a minimum.

Different **PUR (polyurethane insulation) cables** are available:

Table 4-5 Preassembled Loop 2 M12 cables (PUR)

Description	Order Designation	Order No.
Preassembled Loop 2 M12 Cables, 2 x 2 x 0.5 mm² (20 AWG), Straight Male and Female Connectors		
Straight M12 male connector to straight M12 female connector Length: 0.15 m (0.49 ft.)	SAC-4P-M12MS/ 0,15-PUR/M12FS TP	15 06 80 4
Straight M12 male connector to straight M12 female connector Length: 0.3 m (0.98 ft.)	SAC-4P-M12MS/ 0,3-PUR/M12FS TP	15 06 81 7
Straight M12 male connector to straight M12 female connector Length: 0.6 m (1.97 ft.)	SAC-4P-M12MS/ 0,6-PUR/M12FS TP	15 06 82 0
Straight M12 male connector to straight M12 female connector Length: 1.5 m (4.92 ft.)	SAC-4P-M12MS/ 1,5-PUR/M12FS TP	15 06 83 3
Straight M12 male connector to straight M12 female connector Length: 3.0 m (9.84 ft.)	SAC-4P-M12MS/ 3,0-PUR/M12FS TP	15 06 84 6
Loose end to straight M12 female connector; length: 1.5 m (4.92 ft.)*	SAC-4P-M12MS/ 1,5-PUR TP	15 05 22 9
Straight M12 male connector loose end; length: 1.5 m (4.92 ft.)†	SAC-4P-1,5-PUR/M12FS TP	15 05 21 6
Preassembled Loop 2 M12 Cables, 2 x 2 x 0.5 mm² (20 AWG), Angled Male and Female Connectors		
Angled M12 male connector to angled M12 female connector Length: 0.15 m (0.49 ft.)	SAC-4P-M12MR/ 0,15-PUR/M12FR TP	15 05 16 4

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 4-5 Preassembled Loop 2 M12 cables (PUR)

Description	Order Designation	Order No.
Angled M12 male connector to angled M12 female connector Length: 0.3 m (0.98 ft.)	SAC-4P-M12MR/ 0,3-PUR/M12FR TP	15 05 17 7
Angled M12 male connector to angled M12 female connector Length: 0.6 m (1.97 ft.)	SAC-4P-M12MR/ 0,6-PUR/M12FR TP	15 05 18 0
Angled M12 male connector to angled M12 female connector Length: 1.5 m (4.92 ft.)	SAC-4P-M12MR/ 1,5-PUR/M12FR TP	15 05 19 3
Angled M12 male connector to angled M12 female connector Length: 3.0 m (9.84 ft.)	SAC-4P-M12MR/ 3,0-PUR/M12FR TP	15 05 20 3

* On one side preassembled cable used as incoming Loop 2 M12 cable to the Inline branch terminal.

† On one side preassembled cable used as outgoing Loop 2 M12 cable from the Inline branch terminal.

Table 4-6 Loop 2 M12 cable for free assembling

Description	Order Designation	Order No.
Material for Free Assembly of Loop 2 M12 Cables		
Freely configurable M12 male connector	SACC-M12MS-4QLCON	16 40 22 3
Freely configurable M12 female connector	SACC-M12FS-4QLCON	16 40 21 0
Green Loop 2 cable, 2 x 2 x 0.5 mm^2 (20 AWG), twisted pair, PVC	SAC-4P-...-PVC TP	16 96 38 7
Green Loop 2 cable, 2 x 2 x 0.5 mm^2 (20 AWG), twisted pair, PUR	SAC-4P-...-PUR TP	15 06 85 9

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Assembling Loop Cables With M12 Connectors

Pin Assignment

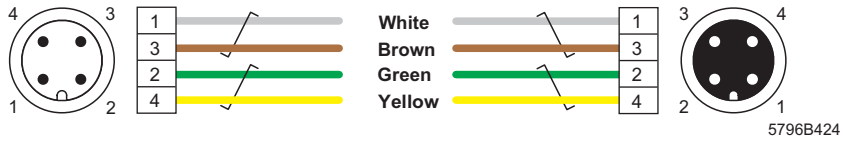


Figure 4-26 Pin assignment of M12 circular connectors

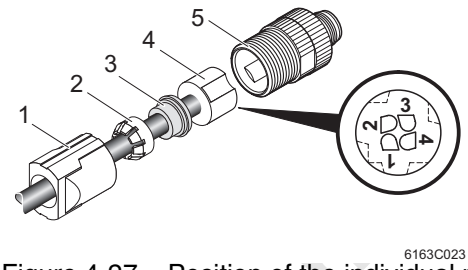


Figure 4-27 Position of the individual parts

– Push the cap nut (1), compression ring (2), and grommet (3) onto the cable (Figure 4-27).

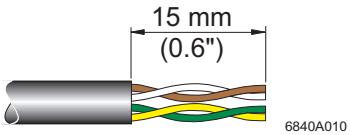


Figure 4-28 Stripping off the cable

– Strip approximately 15 mm (0.591 in.) off the outer cable sheath (Figure 4-28).
– Insert the wire ends into the corresponding splice ring openings (4). Cut off the protruding wire ends (Figure 4-27).
  Ensure that the wire ends are flush with the splice ring; they must neither protrude nor be too short.
– Tighten the threaded joint by turning the cap nut (1). The insulation is cut open and the electrical contact is established (QUICKON).

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.7.4 Connecting the Actuator Supply

Depending on the module type there are different possibilities to connect the actuator supply to the S-Line modules.

IB L2-M BOX 24 DO 4/4 M8-2A

The digital output module with four outputs provides one M12 connection for the actuator supply. For information on the connection, please refer to the module-specific data sheet.

IB L2-M BOX 24 DO 8/8 M8
IB L2-M BOX 24 DIO 4/4/8 M8

For the other modules with outputs the actuator supply can be connected to any output. You can additionally use an M8 Y connector (see page 2-29). This connector enables connecting the actuator supply and the output, or jumpering the actuator supply.

There are three different possibilities to connect the actuator supply:

– To an unused actuator connector (see Figure 4-29),
– Via M8 Y connectors as bus jumpers (see Figure 4-30), or
– Via M8 Y connectors, supplied independently (see Figure 4-31).

Actuators supplied via unused actuator connector

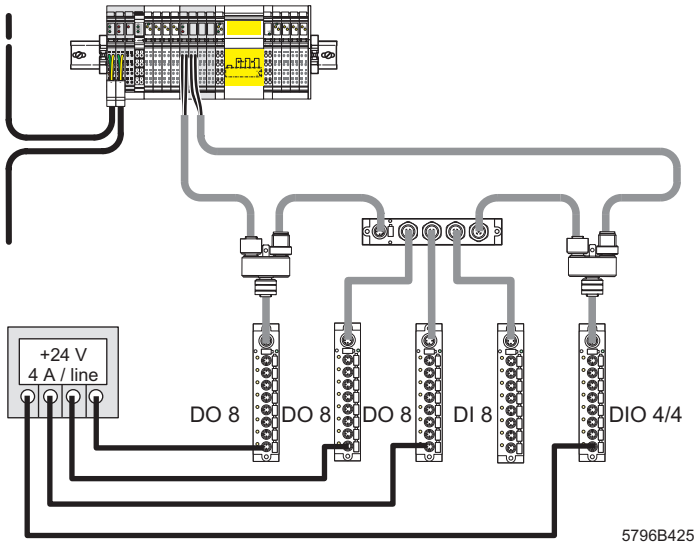


Figure 4-29 Actuator supply via unused actuator connector

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Actuators supplied via M8 Y connectors, jumpered

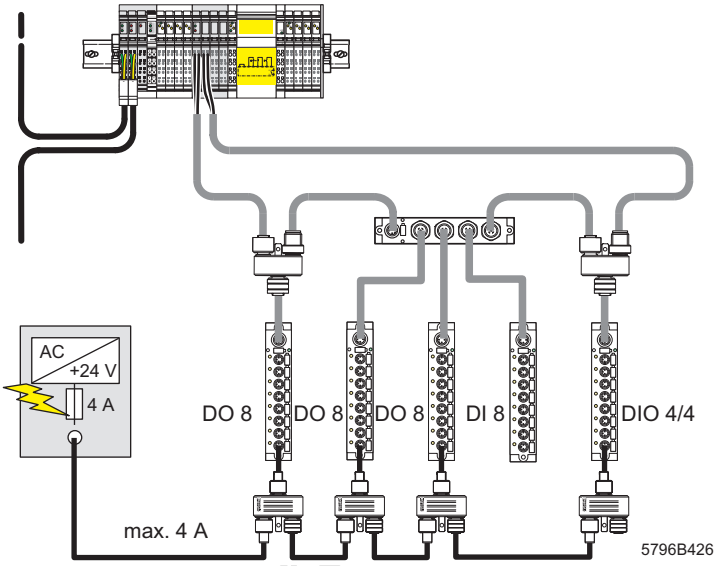


Figure 4-30 Actuator supply via M8 Y connectors, jumpered

Actuators supplied independently via M8 Y connectors

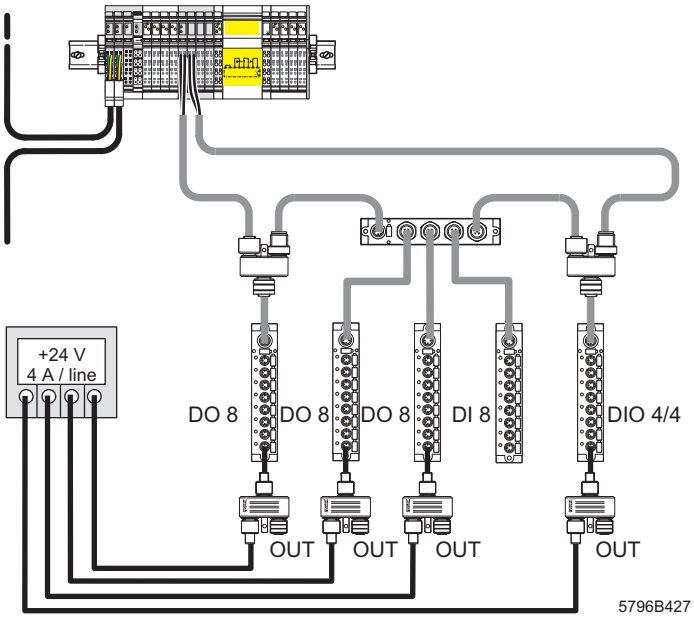


Figure 4-31 Independent actuator supply via M8 Y connectors

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.8 Initial Startup

Information on the initial startup also applies to INTERBUS S-Line. However, grounding is not necessary for S-Line modules.

At initial startup, before connecting the Loop 2 to the bus terminal module make sure that the Loop 2 and actuator supply are correctly installed.

Connecting and testing Loop 2

- Check whether the modules are mounted on a grounded mounting surface or grounded in any other way.
- Check whether all of the modules are connected with the Loop cable.
- Apply 24 V to one side of Loop 2 (A or B in Figure 4-32). Do not apply the actuator supply yet!
- When the voltage is applied at Loop 2, the green DIAG LED on the first module should flash at 4 Hz if the bus terminal module is not connected. On each subsequent module, the green DIAG LED should flash at 0.5 Hz. If not, check the connection starting from the first device on which the LED is not flashing.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

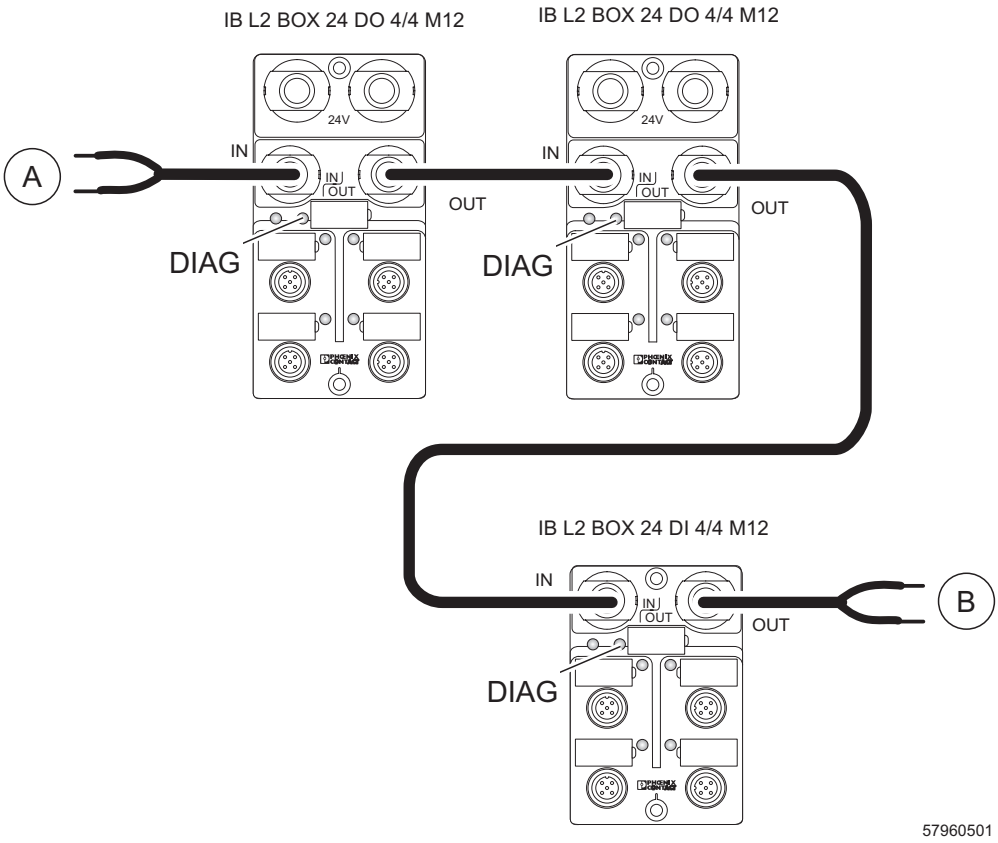


Figure 4-32 Loop 2 connection

Mixing up the polarity (+ and -) of the Loop cable between standard modules does not affect the function.

For the actuator supply, a separate power supply unit should be used to avoid effects on the INTERBUS system. The supply for the module electronics should be electrically isolated from the actuator supply.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

- Apply the actuator voltage U_S to the output modules. The US LED on the modules must be on.

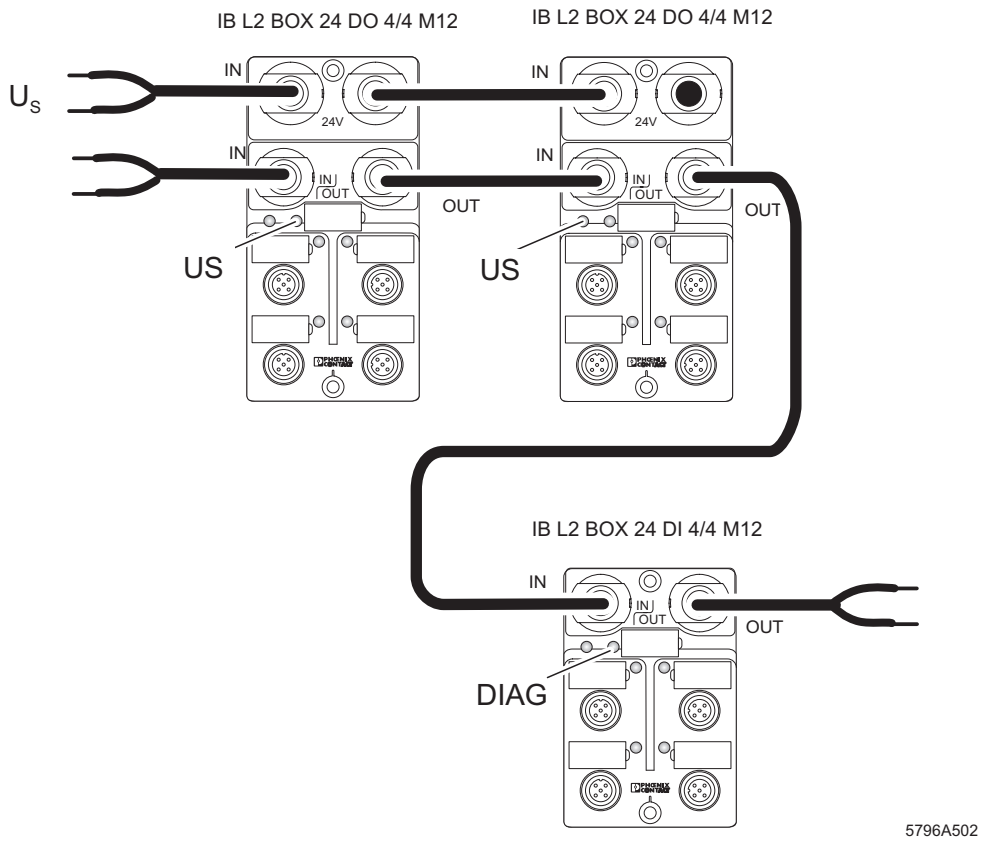


Figure 4-33 Actuator supply connection

If an actuator supply voltage U_S is not applied, no error message is generated. If the actuator voltage is not applied, the DIAG LED does not indicate an error.

- If Loop 2 and the actuator supply are correctly installed, you can connect Loop 2 to the bus terminal module (see Section 4.4.2, "Connecting Loop 2").

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.9 Measuring Voltage Drop

Several factors can cause a drop of the supply voltage to the module electronics and sensors (cable lengths, connected devices, module type).

When installing the bus system, make sure that the voltage U_L for the module electronics does not fall below 19.2 V DC.

The supply voltage for the digital sensors is provided by the voltage U_L. The voltage value for the connected sensors depends on the sensor type. The sensor voltage is U_L minus 3.5 V. If, for example, the sensor requires 20 V, the voltage U_L must be at least 23.5 V.

To ensure that this voltage is available in the event of an error, measure U_L OUT and U_L IN.

When measuring the voltage drop, the bus system must be running and all inputs/outputs must be set.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Measuring U_L OUT and U_L IN (Without Power Module)

INTERBUS connection via Loop 2 bus terminal module

Proceed as follows:

- To measure U_L OUT, connect the measuring instrument between the Loop 2 OUT connection of the bus terminal module and the first module.
- To measure U_L IN, connect the measuring instrument between the Loop 2 IN connection of the bus terminal module and the last module.

If the voltage is within the required range and U_L IN is greater than U_L OUT, the bus is installed correctly. The voltage is supplied at the Loop 2 IN connection of the bus terminal module.

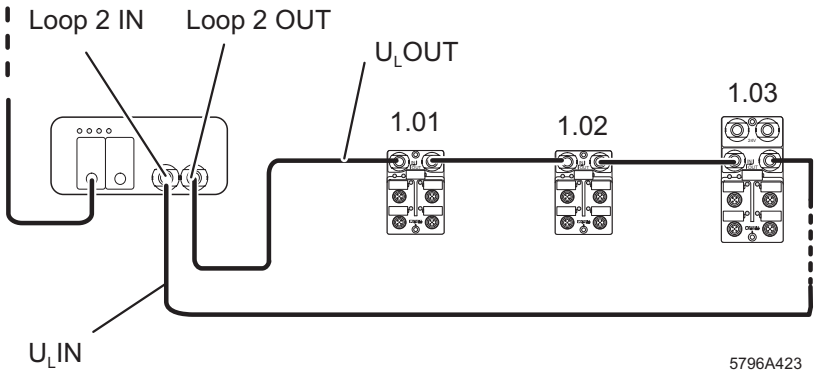


Figure 4-34 Measuring the Loop voltage (Loop 2 bus terminal module)

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

INTERBUS connection via Inline branch terminal

Measuring U_L OUT and U_L IN (With Loop 2 Power Module)

Proceed as follows:

- To measure U_L IN, connect the measuring instrument to the 24 V power connections 03 or 04 of the power module.
- To measure U_L OUT 1, connect the measuring instrument to the connector 1 of the Loop 2 branch terminal (1.1; 2.1).
- To measure U_L IN 2, connect the measuring instrument to the connector 2 of the Loop 2 branch terminal (1.1; 2.1).
- To measure U_L OUT 2, connect the measuring instrument to the Loop 2 power module at Loop OUT (01).

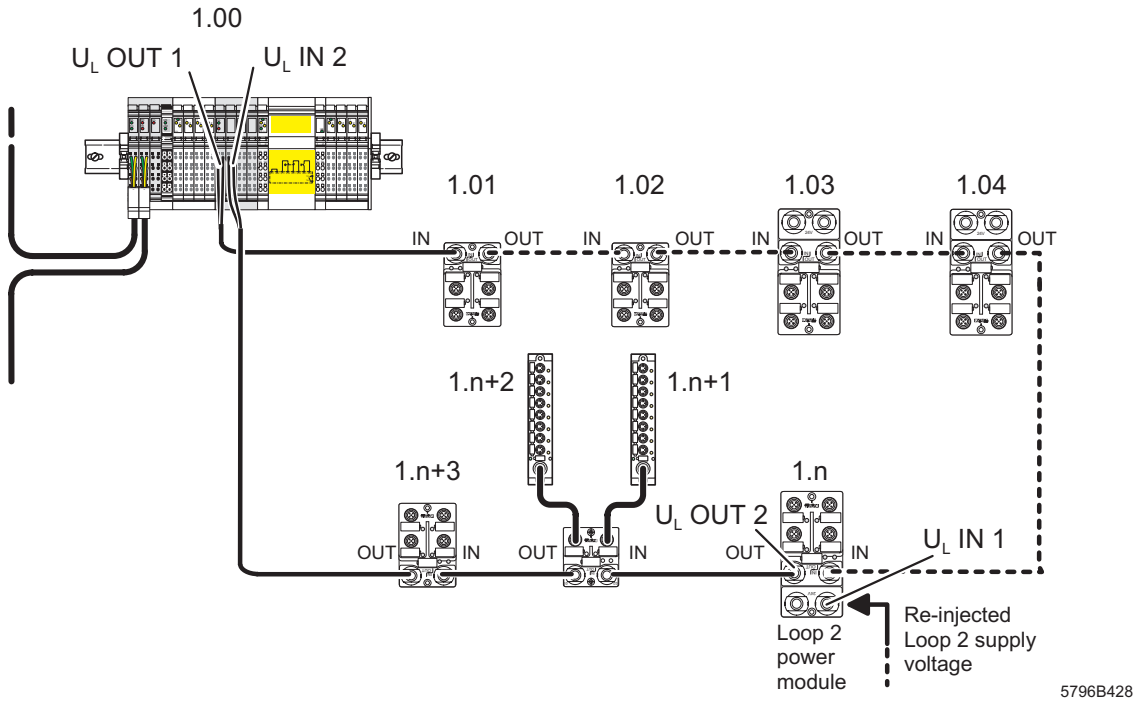


Figure 4-35 Measuring the Loop voltage (Inline with power module)

If the voltage is within the required range and:

– U_L IN 1 is greater than U_L OUT 1 the bus for the modules 1.01 to 1.04 is installed correctly.

– U_L IN 2 is greater than U_L OUT 2 the bus for the modules 1.n to 1.n+3 is installed correctly.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

4.10 Connecting Sensors and Actuators

The connection of the sensors and actuators is shown in the module-specific data sheets since the assignment of the 5-pos. M12 female connectors (and the 3-pos. M8 female connectors in the case of S-Line modules) varies depending on the module type.

The maximum line length for connecting sensors and actuators is 30 m (98.43 ft.).

Wiring the Sensor/Actuator Cables

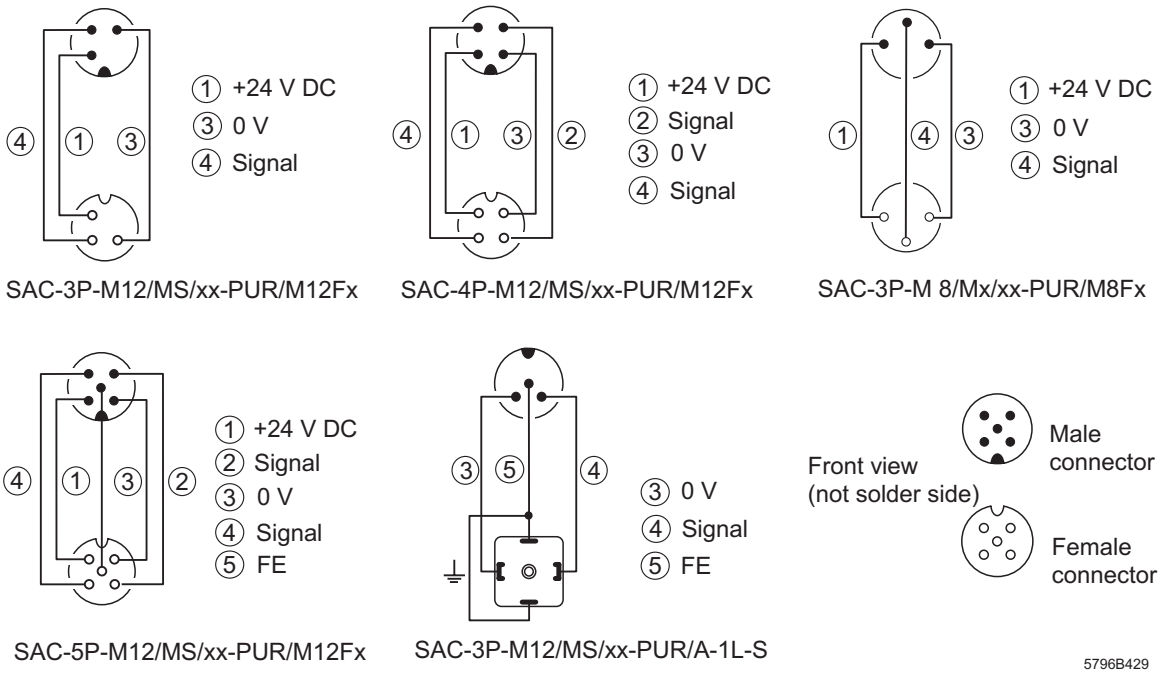


Figure 4-36 Pin assignment of the male and female connectors

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

For the meaning of the product designations please refer to the ordering data (see "Ordering Data for Loop 2 Accessories"on page 7-4).

For the module-specific data, please refer to the corresponding data sheets.

Observe the safety notes in the module-specific data sheets when connecting the individual modules.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 5

This section informs you about
– finding errors
– determining the error cause
– error localization

Error Localization and Removal 5-3

5.1 General Information on Localization of an Error 5-3

5.2 Failure of the Loop Supply 5-4

5.2.1 Determining the Error Cause 5-5

5.2.2 Error Localization 5-7

5.2.3 Error Localized and Removed 5-9

5.2.4 Measuring Procedure 5-10

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

5 Error Localization and Removal

5.1 General Information on Localization of an Error

Loop 2 module diagnostic and status indicators denote the location of errors. An error in the Loop 2 system is indicated locally (see "Diagnostic and Status Indicators"on page 3-17). In addition, the device on which the error has occurred is reported to the control system and can be read using the CMD G4 or PC WORX software.

If an error occurs consider all diagnostics information:

– Check the diagnostic indicators on the bus terminal module (U_{L2})
– Check the diagnostic indicators on the devices (DIAG)
– Check the individual error assignment and the I/O error assignment on the controller board

The indicated error codes in the detected individual error are described in the INTERBUS Diagnostics Guide (IBS SYS DIAG DSC UM E, Order No. 27 47 29 3).

Make sure that the power of the Loop voltage is supplied in the opposite direction of the data flow.

c line components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

5.2 Failure of the Loop Supply

A Loop supply failure may be caused by one of many factors (see "Determining the Error Cause"on page 5-5). The INTERBUS diagnostics states the location at which an error stopped the bus operation.

If a device has detected an error on its Loop IN interface, the diagnostic indicator (DIAG) of this device flashes at 4 Hz. The error can then be on the indicated device, as well as in the line before the indicated device (a prior device or cable fault).

The bus operation is disturbed at a device if, for example, the voltage that supplies the bus operation is no longer sufficient.

When troubleshooting make sure that the cables and the device **before** the device indicating an error are checked, if necessary.

Example:

Device 4.03 indicates an error (diagnostic indicator on the device flashes at 4 Hz).

Check the cable between devices 4.03 and 4.02. If no error is found, check device 4.02 and 4.03. If no error is found, check device 4.01 and the bus terminal module, as well as the cables.

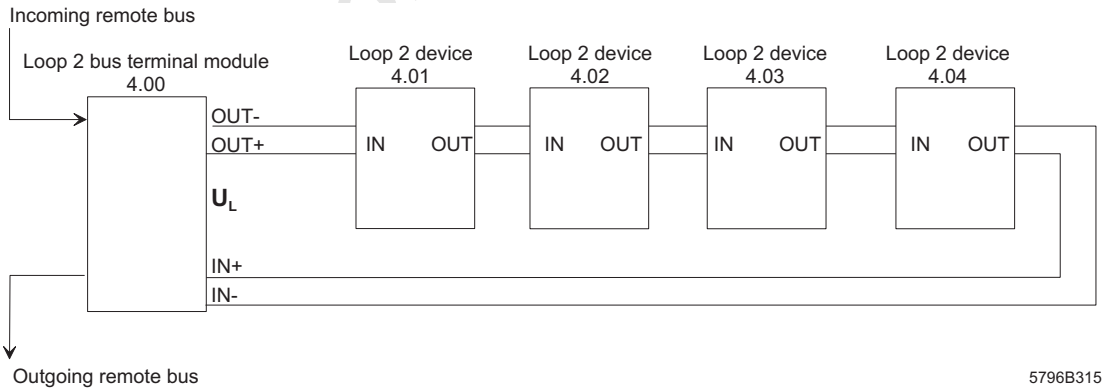


Figure 5-1 Example structure

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

5.2.1 Determining the Error Cause

If an error occurs check the U_{L2} diagnostic indicator on the bus terminal module and the DIAG diagnostic indicator on the local bus device.

These displays indicate the failure of the Loop supply. The following may have been the cause:

1. Failure of the power supply unit
2. Short circuit in the Loop
3. Overload in the Loop
4. Interruption of the Loop

The following table provides an overview of the possible errors, the indicated error location and help for determining the causes. Please refer to the following pages for details on error cause, localization and debugging.

Error	Indicated Error Location	Determining Error Cause
Failure of the voltage supply	Bus terminal module	Check the power supply unit and cable between power supply unit and bus terminal module (U_{L2} = OFF)
Short circuit	Bus terminal module and/or local bus device	Check the diagnostic indicators of the bus terminal module (LC = RED) Measure cable resistance
Overload in the Loop	Bus terminal module and/or local bus device	Measure cable resistance
Loop interrupted	Bus terminal module and/or local bus device	Check the diagnostic indicators of the bus terminal module (U_{L2} = RED) Check the diagnostic indicators of the local bus device (DIAG = OFF) Measure cable resistance

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

The error cause can be determined by measuring the voltages, currents and resistance. For detailed information please refer to "Measuring Procedure"on page 5-10.

Compare your measured results with those in Table 5-1 on page 5-14. The measured results provide information on the type of error.

Make sure that all current and voltage measurements are made when the Loop 2 system is under load, i.e., all inputs and outputs must be set.

Resistance measurements must be carried out when the Loop 2 system is not connected to the power.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

5.2.2 Error Localization

Short Circuit

Effects on the bus

1. Bus error
2. Single error

INTERBUS diagnostics

The bus terminal module and/or device is indicated as an error location (U_{L2} = OFF; DIAG = OFF).

Error localization

- Evaluate the diagnostics for details on the error location (see "General Information on Localization of an Error"on page 5-3).
- Unplug the Loop 2 IN connection on the bus terminal module so that the Loop 2 is disconnected from the power.
- Isolate the Loop cable before the suspected error location (according to diagnostics).
  In this way, the Loop 2 system is divided into two segments.
- To determine the faulty segment, measure the resistance **R4** at the separated point of one segment (see Figure 5-4 on page 5-13). If a low resistance is measured, this indicates a short circuit in this Loop 2 segment.
- Close the connection again and take note of the point in a test protocol for a later search (e.g., identification in the CMD bus configuration).

After removing a QUICKON connection, cut off the slit open wires and connect the QUICKON again (see Section "Connecting Loop 2" on page 4-21).

- Divide the detected faulty segment in the center into two parts. Measure the **R4** resistance at the separated point of one segment part (see Figure 5-4 on page 5-13).

After a few measurements, the error location can be narrowed down so that the faulty point can be localized.

- Remove the error, e.g., by replacing the cable or making a new connection.

Disconnect the Loop 2 system when replacing a module to avoid damaging the system.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

It may be that the voltage is not automatically switched on again by the bus terminal module after removing the short circuit in Loop 2.

In this case, Loop 2 must be disconnected from the power.

- Remove either the Loop IN connection on the bus terminal module or the voltage supply on the bus terminal module.

If a **power module** is integrated in your Loop 2 system, the system consists of two separately supplied segments. Please take this into account during error localization.

Figure 5-2 shows two separate Loop 2 supply voltage circuits when using a power module.

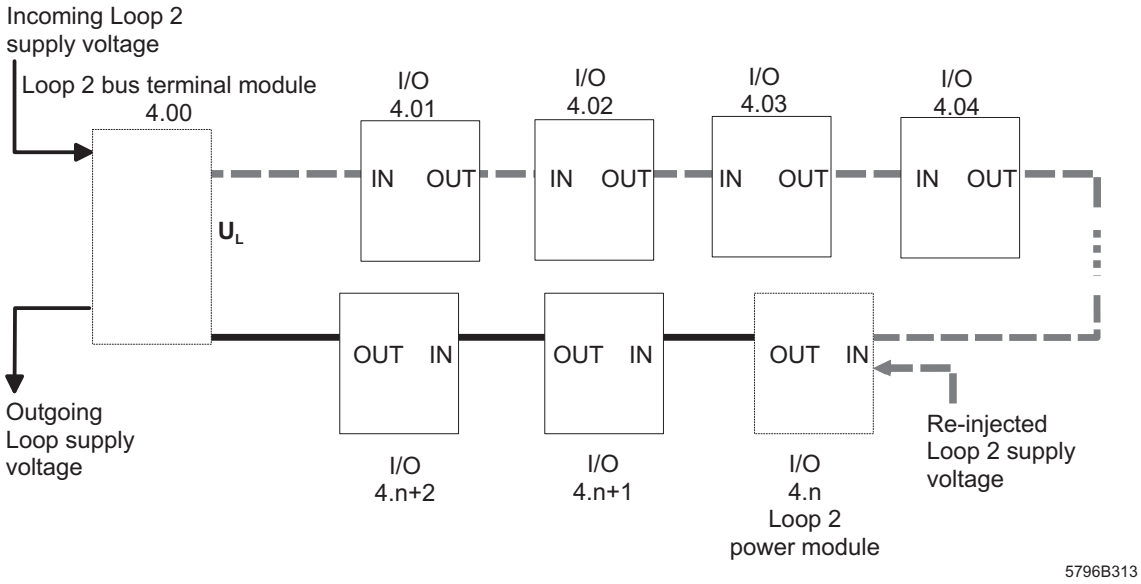


Figure 5-2 Separated Loop 2 supply voltage circuits

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Overload

Effects on the bus

- Bus error
- Cycle error
- I/O error: Undervoltage from the device
- I/O error: Undervoltage from the bus terminal module

INTERBUS diagnostics

Either the bus terminal module or a device is indicated as the error location in the Loop system. The cause is the voltage in the Loop which is too low.

Error localization

- For error localization, please refer to the error case "Short Circuit"on page 5-7.

Interruption

INTERBUS diagnostics

A Loop device in the local bus is indicated as error location.

Error localization

- Check the indicated device, the preceding device and the cable between the devices.

5.2.3 Error Localized and Removed

When an error has been localized and removed, in a few cases the diagnostics may be incorrect due to the different device response times. In this case, start up the bus again. The error location indicated after startup is correct

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

5.2.4 Measuring Procedure

To clearly determine the error cause and localize the corresponding error, proceed as follows:

Measuring Voltage and Current

To measure voltage and current all inputs and outputs of the Loop 2 system must be set.

Make sure that the power of the Loop voltage is supplied in the opposite direction of the data flow.

- To measure the **U1** voltage, connect a voltage measuring device between IN+ and IN- of the Loop IN cable at the bus terminal module. A voltage of between 19.2 V and 30.0 V here is ok.
- To measure the **U2** voltage, connect a voltage measuring device between OUT+ and OUT- of the Loop OUT cable at the bus terminal module. A voltage of between 19.2 V and 30.0 V here is ok.
- To measure the **I1** current, connect a current measuring device to IN+ of the Loop IN cable at the bus terminal module. A current of less than 1.8 A is measured here is ok.

Compare your measured results with those in Table 5-1. The measured results provide information on the type of error.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Figure 5-3 shows how

– Voltage **U1** and current **I1** at the Loop IN connection and
– Voltage **U2** at the Loop OUT connection

are measured.

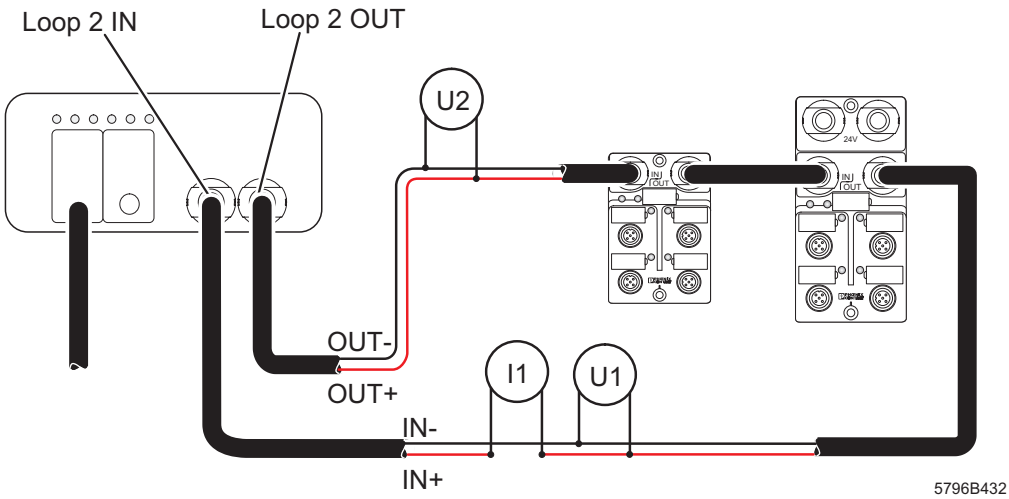


Figure 5-3 Measuring the voltages U1, U2, and the current I1

onlinecomponents

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Measuring the Resistance

The Loop system must be disconnected before carrying out the following measurements.

- Unplug the Loop IN and Loop OUT cable from the bus terminal module.
- To measure the **R1** resistance, connect a resistance measuring device between IN+ and OUT+ of the unplugged Loop IN and Loop OUT cable (detection of a cable interrupt).
- To measure the **R2** resistance, connect a resistance measuring device between IN- and OUT- of the unplugged Loop IN and Loop OUT cable (detection of a cable interrupt).
- To measure the **R3** resistance, connect a resistance measuring device between IN+ and IN- of the Loop IN cable before the last device (4.n+1) (detection of overload or a short circuit)
- To measure the **R4** resistance, connect a resistance measuring device between + and - of the Loop cable, e.g., before the suspected error location (detection of overload or a short circuit).

The **R4** resistance must be measured for **error localization**.
The measurement of this resistance is of no importance when determining the error cause.

Compare your measured results with those in Table 5-1 on page 5-14.
The measured results provide information on the type of error.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

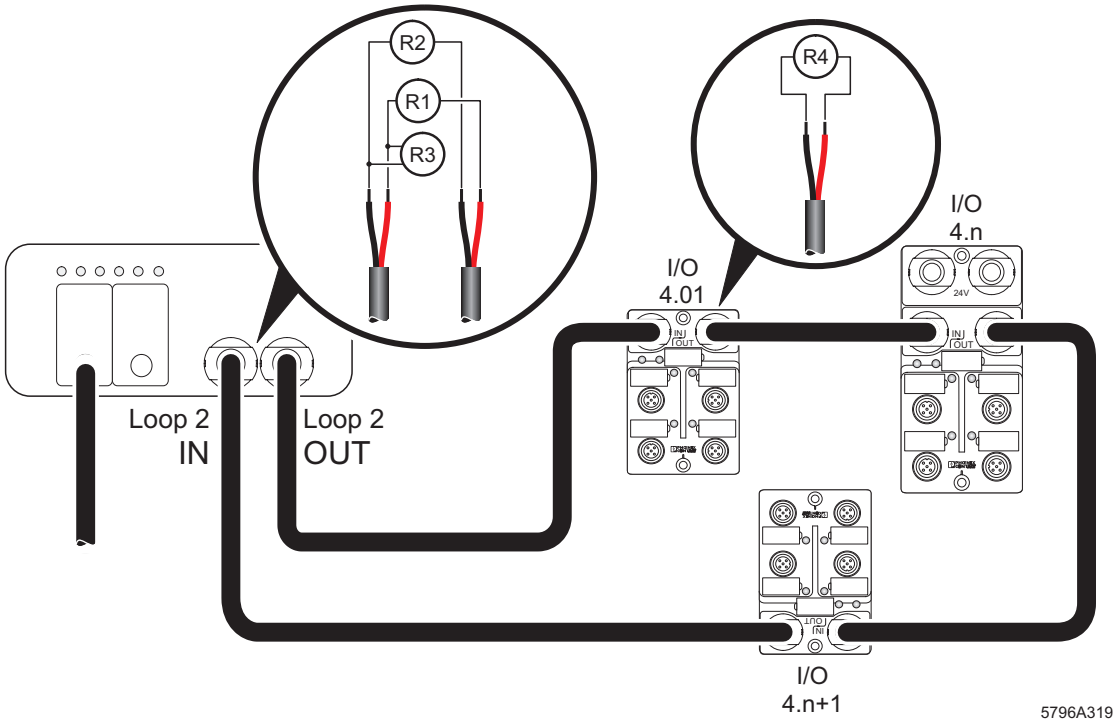


Figure 5-4 Measuring resistances R1 to R4

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 5-1 Error categories

Category	UL LED	U1	U2	I1	R1	R2	R3	R4*
Short circuit	OFF	0 V to 14 V	0 V to 14 V	0 A to 0.5 A	0 Ω to 13 Ω	0 Ω to 13 Ω	0 Ω to 6 Ω	0 Ω to 6 Ω
Overload	OFF/ON	19.2 V to 30 V	14 V to 19.2 V	1.8 A to 5 A	0 Ω to 13 Ω	0 Ω to 13 Ω	4 Ω to 16 Ω	4 Ω to 16 Ω
Interruption	OFF	19.2 V to 30 V	0 V to 14 V	0 A to 1.8 A	>100 Ω	>100 Ω	>16 Ω	>16 Ω

* The R4 resistance must be measured for **error localization**. The measurement of this resistance is of no importance when determining the error cause.

Please note that all data specified in the table depends on the size of the Loop 2 system. Deviations can therefore not be excluded

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 6

This section informs you about
– system data
– technical data

Technical Data 6-3

6.1 System Data 6-3
6.1.1 INTERBUS System Data 6-3
6.1.2 INTERBUS Loop 2 and S-Line System Data 6-5
6.1.3 INTERBUS Inline System Data 6-6
6.2 Technical Data 6-7
6.2.1 INTERBUS Loop 2 Technical Data 6-7
6.2.2 INTERBUS S-Line Technical Data 6-11
6.3 Technical Data of the Cable Types 6-14
6.3.1 INTERBUS Loop Cables 6-14
6.3.2 INTERBUS Loop 2 M12 Cables (S-Line) 6-16
6.3.3 Remote Bus Cables: Overview 6-17
6.3.4 Remote Bus Cables: Electrical Data 6-19
6.3.5 Installation Remote Bus Cables: Overview 6-20
6.3.6 Installation Remote Bus Cables: Electrical Data 6-22

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6 Technical Data

The following tables provide standard data. Please refer to the module-specific data sheets for additional information or to confirm the specific data provided herein.
The technical data does not claim to be complete. Technical modifications reserved.

6.1 System Data

6.1.1 INTERBUS System Data

INTERBUS System	
Number of I/O points	4096, maximum
Number of data words	256, maximum
Transmission speed	500 kbps
Transmission reliability	CR check (Hamming distance: 4)
Protocol	EN 50254

Number of Devices/Levels	
Total number of bus devices	512, maximum
Number of remote bus devices	254, maximum
Number of PCP devices	62, maximum
Number of remote bus levels	16, maximum

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Distances	
From the controller board to the last bus terminal module	12.8 km (164.04 ft), maximum, (copper)
	80 km (9842.52 ft.), maximum, (glass fiber)
From the controller board to the first device	400 m (164.04 ft), maximum, (copper)
	50 m (164.04 ft.), maximum, (polymer fiber)
	300 m (984.252 ft.), maximum (HCS fiber)
	3000 m (9842.52 ft.), maximum, (glass fiber)
Between two remote bus devices	400 m (164.04 ft), maximum, (copper)
	50 m (164.04 ft.), maximum, (polymer fiber)
	300 m (984.252 ft.), maximum (HCS fiber)
	3000 m (9842.52 ft.), maximum, (glass fiber)
Between two installation remote bus devices	50 m (164.04 ft), maximum, (copper)
Between bus terminal module and installation remote bus device	50 m (164.04 ft), maximum, (copper)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.1.2 INTERBUS Loop 2 and S-Line System Data

INTERBUS Loop 2 System Data	
Permitted total length of Loop 2	200 m (656.17 ft.)
Minimum distance between - Bus terminal module and first module - Two modules - Last module and bus terminal module	0.2 m (0.66 ft.)
Maximum distance between - Bus terminal module and first module - Two modules - Last module and bus terminal module	20 m (65.62 ft.)
Max. number of Loop 2 modules (local bus devices)	63
Maximum current carrying capacity of the Loop 2 system	1.8 A
Minimum voltage at the device	19.2 V

The permissible number of devices that can be connected depends on the specific station structure. None of the above mentioned limit parameters may be exceeded.

The number of modules that can be connected to a bus terminal module depends on the current consumption of the modules. The maximum current carrying capacity of the bus terminal module (1.8 A) must not be exceeded.

Observe the voltage drops in the system. For safe bus operation, 19.2 V (including ripple) must be available as supply to each module (see "Measuring Voltage Drop"on page 4-51).

To ensure the 19.2 V, voltage can be boosted into a Loop 2 system via the power module (IB L2 BOX 24 PWR IN DI 4/4 M12).

online components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.1.3 INTERBUS Inline System Data

System Data	
Controller board firmware	Version 4.40 or later
CMD software (for standard controller boards)	Version 4.40 or later
PC WORX software	Version 2.x or later
Number of devices of an Inline station (including the Loop 2 local bus devices)	63, maximum
	If the Loop 2 branch terminal is integrated in an Inline station, the local bus devices of the Loop system are also counted. Please take into account that a maximum of 63 devices can be connected to a bus terminal module (remote bus devices).
Maximum current of the bus terminal in the logic area	2 A
Maximum current consumption of the I/O modules	See module-specific data sheets
	Observe the logic current consumption of each device when configuring an Inline station. This information is given in every module-specific data sheet. The current consumption can differ depending on the individual module. The permissible number of devices that can be connected depends on the specific station structure.
Maximum current carrying capacity of the voltage jumper U_{ANA}	0.5 A
Maximum current carrying capacity of the voltage jumpers U_M, U_S (total current)	8 A
	Observe the current consumption of each device when configuring an Inline station. This information is given in every terminal-specific data sheet. The current consumption can differ depending on the individual terminal. If the maximum current carrying capacity (2 A) of the bus terminal is reached, voltage must be boosted.
	For further technical data regarding the INTERBUS Inline product range, please refer to the documentation specific to this product range.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.2 Technical Data

6.2.1 INTERBUS Loop 2 Technical Data

System Data	
Controller board firmware	Version 4.40 or later
CMD software (for standard controller boards)	Version 4.40 or later
PC WORX software	Version 2.x or later
Number of INTERBUS Loop 2 devices (local bus devices)	63, maximum
If the Loop 2 system is integrated in an Inline station via a Loop 2 branch terminal, the local bus devices of the Inline station are also counted. Please take into account that a maximum of 63 devices can be connected to a bus terminal module (remote bus devices).	
Total length of INTERBUS Loop 2	200 m (656.17 ft.)
Distance between two modules or between bus terminal module/branch terminal and I/O module	20 m (65.62 ft.), maximum 0.2 m (0.66 ft.), minimum
Maximum length of the actuator and sensor cables	30 m (98.43 ft.)
Maximum current consumption of the Loop 2 system	1.8 A
Maximum current consumption of the I/O modules	See module-specific data sheets
Note that not all of the limit values can be met at the same time when configuring INTERBUS Loop 2. The maximum expansion of Loop 2 is reached when **one** of the limit values is reached.	

Ambient Conditions	
Please note that module-specific deviations from the data listed below may occur. For the exact data, please refer to the module-specific data sheets	
Regulations	Developed according to DIN EN 50178, UL 508
Ambient temperature of I/O modules (operation)	-25 °C to +55 °C (-13°F to +131°F)
Ambient temperature of I/O modules (storage/ transport)	-25 °C to +70 °C (-13°F to +158°F)

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Ambient Conditions (Contd.)	
Ambient temperature of motor starter (operation)	-20°C to +40 °C (-4°F to +104°F), no condensation
Ambient temperature of motor starter (storage)	-20 °C to +70 °C (-4°F to +158°F)
Humidity (operation)	100% (condensation permissible)
Humidity (storage/transport with unused interfaces [standard packaging i.e., not capped])	75%, permanent (transport climate category according to EN 60721-3-2 Class 2K2)
For a short period, slight condensation may appear on the outside of the housing if, for example, the module is brought into a closed room from a vehicle.	
Air pressure (operation)	80 kPa to 106 kPa up to 2000 m (6562 ft.) above sea level
Air pressure (storage/transport)	66 kPa to 106 kPa up to 3500 m (11483 ft.) above sea level
Degree of protection	IP 65/IP 67: I/O modules, bus terminal module IP 54: Motor starter (according to DIN 40050, IEC 60536)
Class of protection	Class 3 according to IEC 60536
Air and creepance distances	According to IEC 60664/ IEC 60664A/ DIN VDE 0110: 1989-01 and DIN VDE 0160: 1988-05
Vibration test	5g, 10 Hz to 150 Hz, (IEC 60068-2-6) (Acceleration amplitude above the limit frequency)
Shock test	30g (IEC 60068-2-27)

Supply Voltage of the Module Electronics U_L	
Nominal value	24 V DC
Ripple	1.2 V_{pp} within the permissible voltage range
Permissible voltage range (including ripple)	19.2 V DC to 30 V DC
Protection against polarity reversal	Yes (bridge rectifier)

Supply Voltage of the Actuator Supply U_S	
Nominal value	24 V DC
Ripple	3.6 V_{pp} within the permissible voltage range

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Supply Voltage of the Actuator Supply U_S (Contd.)	
Permissible voltage range (including ripple)	19.2 V DC to 30.0 V DC
⚠	The protection against polarity reversal at the actuator supply is implemented via a diode with an external fuse. To guarantee protection against polarity reversal, the short-circuit current of the power supply unit must be at least four times the nominal current of the fuse.

Connection type	
Remote bus connection (bus terminal module)	MINI-COMBICON connectors 1.5 mm² (16 AWG)
Local bus connection (Loop 2)	QUICKON connection method 2 x 1.5 mm² (16 AWG), PG-11-threaded joint (IP 65/IP 67)
I/O connection	5-pos. M12 connectors
Actuator supply	QUICKON connection method 3 x 1.5 mm² (16 AWG) (24 V, GND, PE), PG-13.5-threaded joint (IP 65/IP 67)

Loop 2 Data Interface	
Cable lengths	
Maximum cable length between two devices	20 m (65.62 ft.)
Minimum cable length between two devices	0.2 m (0.66 ft.)
INTERBUS Loop 2 maximum total length	200 m (656.17 ft.)
Error evaluation	Diagnostic and status indicators
Electrical isolation	Module-specific

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Conformance With EMC Directive 89/336/EEC		
Conformance only exists if the module is connected to functional earth ground (FE).		
Noise immunity test according to EN 50082-2:1995		
Electrostatic discharge (ESD)	EN 61000-4-2:1995/ IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge
Electromagnetic fields	EN 61000-4-3:1993/ IEC 61000-4-3	Criterion A Field strength: 10 V/m
Fast transients (burst)	EN 61000-4-4:1995/ IEC 61000-4-4	Criterion B Supply lines: 2 kV Signal/data lines: 2 kV
Conducted interference	EN 61000-4-6:1993/ IEC 61000-4-6	Criterion A Test voltage 10 V
Noise emission test according to EN 50081-2:1993		
Noise emission of housing	EN 55011:1991	Class A

Mechanical Capability		
Shock	IEC 60068-2-27:1987	30g
Vibration (operation)	IEC 60068-2-6:1982	5g
Vibration (transport)	IEC 60068-2-6:1982	5g

Module-specific deviations can occur for the data on the conformance with the EMC directive and mechanical capability.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.2.2 INTERBUS S-Line Technical Data

General Data	
Housing material	PBT V0, self-extinguishing (V0)
Drill hole spacing	129 mm (5.078 in.)
Temperature (operation)	-25 °C to +55 °C (-13°F to +131°F)
Temperature (storage)	-25 °C to +70 °C (-13°F to +158°F)
Humidity (operation)	100% (condensation permissible)9
Humidity (storage/transport with unused interfaces [standard packaging i.e., not capped])	75%, permanent (transport climate category according to EN 60721-3-2 Class 2K2)
For a short period, slight condensation may appear on the outside of the housing if, for example, the module is brought into a closed room from a vehicle.	
Humidity (storage/transport with used interfaces [filler plugs on all unused connections])	100%, condensation permissible (transport climate category according to EN 60721-3-2 Class 2K3)
The requirements of EN 50178 regarding storage and transport are met.	
Air pressure (operation)	80 kPa to 106 kPa up to 2000 m (6562 ft.) above sea level
Air pressure (storage)	70 kPa to 106 kPa up to 3000 m (9843 ft.) above sea level
Degree of protection	IP 65/IP 67 according to IEC 60529 Class 12 according to NEMA 250
Class of protection	Class 3 according to EN 50178
Resistance to oil and lyes	E.g., soluble oil, lubricants, detergents. The use of the module in corrosive media should be decided on the basis of each individual case.
Resistance to gases that may endanger functions according to DIN 40046-36, DIN 40046-37	Sulfur dioxide (SO_2) 10 cm^3/m^3 ± 0.3 cm^3 (25°C [77°F] and 75% humidity), Hydrogen sulfide (H_2S) 1 cm^3/m^3 ± 0.3 cm^3/m^3 (25°C [77°F] and 75% humidity)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Loop 2 M12 Interface	
Connection	M12 circular connectors
Number of pins	4
Cable diameter	0.5 mm^2 (20 AWG)
Signals	IN+, IN-, OUT+, OUT-
Current carrying capacity	1.8 A
Contact resistance	≤ 5 mΩ
Through resistance	80 mΩ per path
Maximum voltage drop between IN and OUT	0.3V
Cable lengths	
Maximum cable length between two devices	20 m (65.62 ft.)
Minimum cable length between two devices	0.2 m (0.66 ft.)
INTERBUS Loop 2 maximum total length	200 m (656.17 ft.)
Error evaluation	Diagnostic and status indicators
Electrical isolation	Module-specific

Supply Voltage of the Module Electronics U_L (From the Loop 2 Cable)	
Nominal voltage	24 V DC
Permissible voltage range (ripple included)	19.2 V DC to 30 V DC
Ripple	1.2 V_{pp} within the permissible voltage range
Current consumption	0.06 A
Protection against polarity reversal	Yes (bridge rectifier)

Approvals	
CE	Yes
UL	In preparation
INTERBUS certification	In preparation

Supply Voltage of the Actuator Supply U_S	
Nominal value	24 V DC
Ripple	3.6 V_{pp} within the permissible voltage range

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Supply Voltage of the Actuator Supply U_S (Contd.)	
Permissible voltage range (including ripple)	19.2 V DC to 30.0 V DC
⚠	The protection against polarity reversal at the actuator supply is implemented via a diode with an external fuse. To guarantee protection against polarity reversal, the short circuit current of the power supply unit must be at least four times the nominal current of the fuse.

Conformance With EMC Directive 89/336/EEC		
☞	Conformance only exists if the module is connected to functional earth ground (FE).	
Noise immunity test according to EN 50082-2:1995		
Electrostatic discharge (ESD)	EN 61000-4-2:1995/ IEC 61000-4-2	Criterion B 6 kV contact discharge 8 kV air discharge
Electromagnetic fields	EN 61000-4-3:1993/ IEC 61000-4-3	Criterion A Field strength: 10 V/m
Fast transients (burst)	EN 61000-4-4:1995/ IEC 61000-4-4	Criterion B Supply lines: 2 kV Signal/data lines: 2 kV
Conducted interference	EN 61000-4-6:1993/ IEC 61000-4-6	Criterion A Test voltage 10 V
Noise emission test according to EN 50081-2:1993		
Noise emission of housing	EN 55011:1991	Class A

Mechanical Capability		
Shock	IEC 60068-2-27:1987	30g
Vibration (operation)	IEC 60068-2-6:1982	5g
Vibration (transport)	IEC 60068-2-6:1982	5g

☞ Module-specific deviations can occur for the data on the conformance with the EMC directive and mechanical capability.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.3 Technical Data of the Cable Types

6.3.1 INTERBUS Loop Cables

Table 6-1 Specifications for installation local bus cables* (fixed)

	IBSL SLC CU2/1,5-METER	IBSL PSC CU3/1,5-METER
Order No.	27 21 62 0	27 22 13 7
Application	Installation local bus/sensor supply (indoor installation); with meters marked on the cable	Actuator supply (indoor installation)
Structure	2 single conductors with common outer sheath, twisted, unshielded	3 single conductors with common outer sheath, unshielded
Color coding of the wires	DIN 47100 Brown, blue	DIN 47100 Brown, blue, green/yellow
Conductor cross section	1.5 mm² (16 AWG)	
Outside diameter	7.5 mm (0.295 in.)	8.4 mm (0.331 in.)
Outer cable sheath	Green (RAL 6017) Special mixture on PVC base	Black (RAL 9005) Special mixture on PVC base
Litz wire structure	Finely stranded (VDE 0295, class 5)	
Operating temperature	Fixed -30 °C to +70°C (-22°F to +158°F)	
Bending radius	Fixed at least 8 x D (60 mm [2.362 in.], minimum)	Fixed at least 8 x D (67.2 mm [2.646 in.], minimum)
Test voltage wire-wire	U_{rms} = 1000 V, 1 min (VDE 0472-509, test type C, IEC 60189 cl. 5.2)	
Conductor resistance	13.3 Ω/km (3208 ft.), maximum (VDE 0295)	
Isolation resistance (after testing the dielectric strength)	20 MΩ/km (3208 ft.), minimum (VDE 0472-502, test type B, ICE 60189-1 cl. 5.3)	

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 6-1 Specifications for installation local bus cables* (fixed)

(Contd.)	IBSL SLC CU2/1,5-METER	IBSL PSC CU3/1,5-METER
Characteristic impedance	75 Ω ±5% at f = 250 kHz to 10 MHz (IEC 61156-1 cl. 3.3.6)	–
Environmental compatibility	Free of substances which hinder coating with paint or varnish (chloroform test according to the central 57650 standard of VW, Audi and Seat)	

* These are typical values at 20°C (68°F) ambient temperature.

Table 6-2 Specifications for installation local bus cables* (very flexible)

	IBS DATA/2HD/F	IBS PWR/3HD/F
Order No.	28 19 94 3	27 25 08 0
Application	Installation local bus/sensor supply, very flexible	Actuator supply, very flexible
Structure	2 single conductors with common outer sheath, twisted, unshielded	3 single conductors with common outer sheath, unshielded
Color coding of the wires	VDE 0293 Brown, blue	Coding acc. to numbers black (1), black (2), yellow (3)
Conductor cross section	1.5 mm² (16 AWG)	
Outside diameter	7.5 mm (0.295 in.)	8.0 mm (0.315 in.)
Outer cable sheath	Yellow-green (RAL 6018) PUR mixture	Matt gray (RAL 7041) PUR mixture
Litz wire structure	Finely stranded (VDE 0295, class 5)	
Operating temperature	Fixed -20 °C to +70°C (-4°F to 158°F) Flexible -10 °C to +60 °C (+14°F to +140°F)	
Bending radius	Fixed at least 2 x D (15 mm [2.362 in.], minimum) Flexible at least 10 x D (75 mm [2.953 in.], minimum)	Fixed at least 2 x D (16 mm [2.646 in.], minimum) Flexible at least 10 x D (80 mm [3.150 in.], minimum)

* These are typical values at 20°C (68°F) ambient temperature.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.3.2 INTERBUS Loop 2 M12 Cables (S-Line)

Table 6-3 Specifications for Loop 2 M12 cables

	SAC-4P-...PVC TP	SAC-4P-...PUR TP
Order No.	16 96 38 7	15 06 85 9
Application	Loop 2 M12 connection (indoor installation)	
Structure	2 x 2 single conductors with common outer sheath, twisted in pairs and as a whole, unshielded	
Color coding of the wires	White, brown, green, yellow	
Conductor cross section	0.5 mm² (20 AWG)	
Outside diameter	8.1 mm (0.319 in.)	7.8 mm (0.307 in.)
Outer cable sheath	Green (RAL 6017) PVC	Green (RAL 6017), matt PUR
Litz wire structure	CU litz wire, plain, approx. 16 x 0,2 mm (0.630 x 0.008 in.)	CU litz wire, plain, approx. 28 x 0.15 mm (1.102 x 0.006 in.)
Operating temperature	Fixed -40°C to +80 °C (-40°F to +176°F) Flexible -5 °C to +80 °C (+23°F to +176°F)	
Bending radius	Fixed at least 10 x D (81 mm [3.189 in.], minimum)	Flexible at least 10 x D (78 mm [3.070 in.], minimum)
Test voltage	1500 V	
Nominal voltage	U0/U = 300/500 V U0 – U_{rms} between two outer conductors	
Resistance	Almost oil-resistant	Good resistance to oil and fuel according to VDE 0250 and VDE 0472
Approvals	In accordance with VDE standards, CE-compliant	

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.3.3 Remote Bus Cables: Overview

Table 6-4 Overview of remote bus cables

	IBS RBC METER-T	IBS RBC METER/F-T	IBS RBC METER/E-T
Order No.	28 06 28 6	27 23 12 3	27 23 14 9
Application	For fixed wiring	For highly flexible applications	For permanent indoor and outdoor installation (even underground)
Structure	3 x 2, twisted-pair, with common shielding (tinned copper braided shield)		
	–	–	Additionally reinforced PVC outer sheath
Color coding of the wires	DIN 47100 Pink, gray, yellow, green, white, brown (data lines)		
Conductor cross section	0.22 mm²	0.25 mm² (24 AWG)	0.22 mm²
Outside diameter	7.2 mm (0.283 in.)	8.1 mm (0.319 in.)	9.3 mm (0.366 in.)
Outer cable sheath	Green (RAL 6017), flame-retardant	Green (RAL 6017), flame-retardant, halogen-free	Black (RAL 9005), UV resistant
Operating temperature	Fixed -30 °C to +70 °C (-22°F to +158°F)	Fixed -30 °C to +70 °C (-22°F to +158°F) Flexible -5 °C to +70°C (+23°F to +158°F)	Fixed -30 °C to +70°C (-22°F to +158°F)
Weight	7.2 kg/100 m (328 ft.)	7.4 kg/100 m (328 ft.)	9.4 kg/100 m (328 ft.)
Bending radius	Fixed 58 mm (2.283 in.), minimum	Flexible 122 mm (4.803 in.), minimum	Fixed 75 mm (2.953 in.), minimum

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 6-4 Overview of remote bus cables

	IBS RBC METER-T	IBS RBC METER/F-T	IBS RBC METER/E-T
Conductor resistance	186 Ω/km (3208 ft.), maximum (loop)	159.8 Ω/km (3208 ft.), maximum (loop)	186 Ω/km (3208 ft.), maximum (loop)
Environmental compatibility	Free of substances which would hinder coating with paint or varnish (chloroform test according to central standard 57650 of VW, Audi and Seat)		
INTERBUS certification number	112	117	116

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.3.4 Remote Bus Cables: Electrical Data

Table 6-5 Electric data of remote bus cables

Characteristic Size at 20°C (68°F)	Value	Test Method
DC conductor resistance per 100 m (328.08 ft.)	9.6 Ω, maximum	VDE 0472-501 IEC 60189-1 cl. 5.1
Characteristic impedance	120 Ω ± 20% at f = 0.064 MHz 100 Ω ±15% at f > 1 MHz	IEC 61156-1 cl. 3.3.6
Dielectric strength **Wire/wire** **Wire/shield**	 1000 V_{rms}, 1 min 1000 V_{rms}, 1 min	VDE 0472-509 test type C IEC 60189-1 cl. 5.2
Isolation resistance (after testing dielectric strength)	150 MΩ minimum for 1 km (3280 ft.) cable	VDE 0472-502 test type B IEC 60189-1 cl. 5.3
Maximum transfer impedance (coupling resistance) at 30 MHz	250 mΩ/m (3.28 ft.)	IEC 60096-1
Effective capacitance at 800 Hz	60 nF, maximum, for 1 km (3280 ft.) cable	VDE 0472-504 test type A IEC 60198-1 cl. 5.4
Minimum near-end crosstalk attenuation (NEXT) for 100 m (328.08 ft.) cable	At 0.772 MHz 61 dB At 1 MHz 59 dB At 2 MHz 55 dB At 4 MHz 50 dB At 8 MHz 46 dB At 10 MHz 44 dB At 16 MHz 41 dB At 20 MHz 40 dB	VDE 0472-517 IEC 61156-1 cl. 3.3.4
Maximum wave attenuation for 100 m (328.08 ft.) cable	At 0.256 MHz 1.5 dB At 0.772 MHz 2.4 dB At 1 MHz 2.7 dB At 4 MHz 5.2 dB At 10 MHz 8.4 dB At 16 MHz 11.2 dB At 20 MHz 11.9 dB	VDE 0472-515 IEC 61156-1 cl. 3.3.2

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.3.5 Installation Remote Bus Cables: Overview

Table 6-6 Overview of installation bus cables

	IBS INBC METER	IBS INBC METER/S	IBS INBC METER/E
Order No.	27 23 13 6	27 59 87 0	27 23 15 2
Application	For fixed wiring Partially welding-resistant	For highly flexible applications Partially welding-resistant	For permanent indoor and outdoor installation (even underground)
	With additional wires for the power supply		
Structure	3 x 2, twisted-pair (data), 3 single wires (power), with common shielding (braided shield consisting of high-grade steel)		
	–	–	Additionally reinforced PVC outer sheath
Color coding of the wires	DIN 47100 Pink, gray, yellow, green, white, brown (data) blue, red, green/yellow (power)		
Conductor cross section	0.22 mm² (data) 1.0 mm² (17 AWG) (power)	0.25 mm² (24 AWG) (data) 1.0 mm² (18 AWG) (power)	0.22 mm² (data) 1.0 mm² (18 AWG) (power)
Outside diameter	7.9 mm (0.311 in.)	7.9 mm (0.311 in.)	9.4 mm (0.370 in.)
Outer cable sheath	Green (RAL 6017), flame-retardant	Green (RAL 6017), flame-retardant, halogen-free	Black (RAL 9005), UV resistant
Operating temperature	Fixed -30 °C to +70°C (-22°F to +158°F)	Fixed -30 °C to +70°C (-22°F to +158°F) Flexible -5 °C to +70°C (+23°F to +158°F)	Fixed -30 °C to +70°C (-22°F to +158°F)
Weight	8.5 kg/100 m (328 ft.)	9.5 kg/100 m (328 ft.)	12.8 kg/100 m (328 ft.)

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 6-6 Overview of installation bus cables

	IBS INBC METER	IBS INBC METER/S	IBS INBC METER/E
Bending radius	Fixed at least 64 mm (2.520 in.)	Flexible at least 119 mm (4.685 in.)	Fixed at least 76 mm (2.992 in.)
Conductor resistance	186 Ω/km (3280 ft.), maximum (loop)	159.8 Ω/km (3280 ft.), maximum (loop)	186 Ω/km (3280 ft.), maximum (loop)
Environmental compatibility	Free of substances which would hinder coating with paint or varnish (chloroform test according to central standard 57650 of VW, Audi and Seat)		
INTERBUS certification number	115	114	113

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

6.3.6 Installation Remote Bus Cables: Electrical Data

Table 6-7 Electric data of installation remote bus cables

Characteristic Size at 20°C (68°F)	Value	Test Method
DC conductor resistance **per 100 m (328.08 ft.) signal line** **Per 100 m (328.08 ft.) supply line**	 Maximum 9.6 Ω Maximum 2.2 Ω	VDE 0472-501 IEC 60189-1 cl. 5.1
Characteristic impedance of the data line pairs	120 Ω ± 20% at f = 0.064 MHz 100 Ω ±15% at f > 1 MHz	IEC 61156-1 cl. 3.3.6
Dielectric strength **Wire/wire** **Wire/shield**	 1000 V_{rms}, 1 min 1000 V_{rms}, 1 min	VDE 0472-509 test type C IEC 189-1 cl. 5.2
Isolation resistance (after testing dielectric strength)	150 MΩ, minimum, for 1 km (3280 ft.) cable	VDE 0472-502 test type B IEC 60189-1 cl. 5.3
Maximum transfer impedance (coupling resistance) at 30 MHz	250 mΩ/m (3.28 ft.)	IEC 60096-1

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 6-7 Electric data of installation remote bus cables

Characteristic Size at 20°C (68°F)	Value	Test Method
Effective capacitance at 800 Hz	60 nF, maximum, for 1 km (3280 ft.) cable	VDE 0472-504 test type A IEC 6098-1 cl. 5.4
Minimum near-end crosstalk attenuation (NEXT) for 100 m (328.08 ft.) cable	At 0.772 MHz 61 dB At 1 MHz 59 dB At 2 MHz 55 dB At 4 MHz 50 dB At 8 MHz 46 dB At 10 MHz 44 dB At 16 MHz 41 dB At 20 MHz 40 dB	VDE 0472-517 IEC 61156-1 cl. 3.3.4
Maximum wave attenuation for 100 m (328.08 ft.) cable	At 0.256 MHz 1.5 dB At 0.772 MHz 2.4 dB At 1 MHz 2.7 dB At 4 MHz 5.2 dB At 10 MHz 8.4 dB At 16 MHz 11.2 dB At 20 MHz 11.9 dB	VDE 0472-515 IEC 61156-1 cl. 3.3.2

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 7

This section informs you about
– ordering data

Ordering Data 7-3

7.1 Ordering Data for Loop 2 Modules 7-3
7.2 Ordering Data for Loop 2 Accessories 7-4
7.3 Ordering Data for S-Line Modules 7-5
7.4 Ordering Data S-Line Accessories 7-5
7.5 Ordering Data for Documentation 7-10

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

7 Ordering Data

7.1 Ordering Data for Loop 2 Modules

Table 1

Description	Order Designation	Order No.
Bus terminal module	IBS L2 IP 24 BK-T	27 32 37 6
Loop 2 branch terminal	IB IL 24 L2	27 27 88 6
Power module with four digital inputs	IB L2 BOX 24 PWR IN DI 4/4 M12	27 32 39 2
Power module with four digital inputs and double-assigned M12 sockets	IB L2 BOX 24 PWR IN DI 4/4 M12-D	27 32 79 0
Input module with four digital inputs	IB L2 BOX 24 DI 4/4 M12	27 31 98 2
Input module with four digital inputs and double-assigned M12 sockets	IB L2 BOX 24 DI 4/4 M12-D	27 32 76 1
Output module with four digital outputs	IB L2 BOX 24 DO 4/4 M12-2A	27 32 34 7
Output module with four digital outputs and double-assigned M12 sockets	IB L2 BOX 24 DO 4/4 M12-2A-D	27 32 77 4
Input/output module with two digital inputs and two digital outputs	IB L2 BOX 24 DIO 2/2/4 M12-2A	27 32 00 4
Input/output module with two digital inputs and two digital outputs and double-assigned M12 sockets	IB L2 BOX 24 DIO 2/2/4 M12-2A-D	27 32 78 7
Input module with eight digital inputs	IB L2 BOX 24 DI 8/4 M12	27 31 99 5
Input module with two analog inputs	IB L2 BOX AI 2/2 M12	27 31 90 8
Analog module for temperature sensors	IB L2 BOX TEMP 2/2 M12	27 31 92 4
Output module with one analog current output	IB L2 BOX AO 1/2/I M12	27 31 93 7
Output module with one analog voltage output	IB L2 BOX AO 1/2/U M12	27 31 94 0
Motor starter	IB L2 IP 500 MLR 4-6A	27 32 38 9

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

7.2 Ordering Data for Loop 2 Accessories

Table 2

Description	Order Designation	Order No.
Spare fuse 5 x 20/3,15 AT	IBS FUSE 5X20/3,15AT	27 22 38 6
Loop cable, green, with meters marked on the cable, 2 x 1.5 mm² (16 AWG)	IBSL SLC CU2/1,5-METER	27 21 62 0
Actuator supply line, black, 3 x 1.5 mm² (16 AWG)	IBSL PSC CU3/1,5 METER	27 22 13 7
Loop set with 50 Zack ("Quick") marker strips and 15 protective caps for M12 sensor/actuator sockets	IBSL ZB-SET	27 21 98 9
Loop PG set consisting of 5 filler plugs for the actuator supply and 20 PG threaded joints, PG 11 and PG 13.5	IBSL PG-SET	27 21 99 2
Protective caps for unused sensor/actuator connections (5 pcs.)	IBS IP PROT IO	27 59 91 9
Shield plate	IB L2 SHIELD	27 32 41 5
Markers (50 pcs.)	White: SS ZB WH Yellow: SS ZB YE	50 31 17 1 50 31 65 0

For ordering data for freely configurable M12 connectors and for assembled sensor/actuator cables for Loop 2 modules, please refer to the INTERBUS & AUTOMATION catalog.

For varying module data, please refer to the corresponding data sheet or the INTERBUS & AUTOMATION catalog.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

7.3 Ordering Data for S-Line Modules

Table 3

Description	Order Designation	Order No.
S-Line module with eight digital inputs	IB L2-M BOX 24 DI 8/8 M8	28 19 14 7
S-Line module with four digital outputs	IB L2-M BOX 24 DO 4/4 M8-2A	28 19 36 7
S-Line module with eight digital outputs	IB L2-M BOX 24 DO 8/8 M8	28 19 34 1
S-Line module with four digital inputs and four digital outputs	IB L2-M BOX 24 DIO 4/4/8 M8	28 19 20 2
S-Line module with four illuminated push-buttons	IB L2-M BOX 24 DIO 4/4 BT	28 19 27 3

7.4 Ordering Data S-Line Accessories

Table 4

Description	Order Designation	Order No.
Protective caps for unused M8 female connectors (pack of 5)	PROT-M8	16 82 54 0
Zack marker, without color print, for labeling with pencil (pack of 10)	ZB 5/M8:UNBEDRUCKT	16 99 94 4
M8 Y connector for the actuator supply	SAC-3P-M 8Y/2XM 8FS VP	16 96 22 2
Use in INTERBUS Loop 2		
Twin box, for connecting two S-Line modules to the unshielded Loop 2 cable using QUICKON connectors	IB L2 BOX ADAP 2/2 M12	28 19 15 0
Short-circuit connector for unused M12 female connectors on the twin box	SAC-4P-M12MS L2 SCP	16 96 31 6
Use in INTERBUS Loop 2 M12		
Y connector for bus connection (green)	IB L2-M ADAP 1/1 M12	28 19 16 3

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 4

Description	Order Designation	Order No.
Y connector for setting up a safety circuit (yellow)	IB L2-M ESTOP-ADAP 1/1 M12	28 19 18 9
ADAP box for connecting up to three S-Line modules to Loop 2 M12	IB L2-M ADAP 3/3 M12	28 19 35 4

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 4

Description	Order Designation	Order No.
Preassembled Loop 2 M12 Cables, 2 x 2 x 0.5 mm² (20 AWG), Twisted Pair, PUR, Straight Male and Female Connectors		
Straight M12 male connector to straight M12 female connector; Length: 0.15 m (0.49 ft.)	SAC-4P-M12MS/0,15-PUR/M12FS TP	15 06 80 4
Straight M12 male connector to straight M12 female connector; Length: 0.3 m (0.98 ft.)	SAC-4P-M12MS/ 0,3-PUR/M12FS TP	15 06 81 7
Straight M12 male connector to straight M12 female connector; Length: 0.6 m (1.97 ft.)	SAC-4P-M12MS/ 0,6-PUR/M12FS TP	15 06 82 0
Straight M12 male connector to straight M12 female connector; Length: 1.5 m (4.92 ft.)	SAC-4P-M12MS/ 1,5-PUR/M12FS TP	15 06 83 3
Straight M12 male connector to straight M12 female connector; Length: 3.0 m (9.84 ft.)	SAC-4P-M12MS/ 3,0-PUR/M12FS TP	15 06 84 6
Loose end to straight M12 female connector; Length: 1.5 m (4.92 in.) (on one side preassembled cable used as incoming Loop 2 M12 cable to the Inline branch terminal)	SAC-4P-M12MR/ 1,5-PUR TP	15 05 22 9
Straight M12 male connector to loose end; Length: 1.5 m (4.92 in.) (on one side preassembled cable used as outgoing Loop 2 M12 cable from the Inline branch terminal)	SAC-4P- 1,5-PUR/M12FR TP	15 05 21 6
Preassembled Loop 2 M12 Cables, 2 x 2 x 0.5 mm² (20 AWG), Twisted Pair, PUR, Angled Male and Female Connectors		
Angled M12 male connector to angled M12 female connector; Length: 0.15 m (0.49 ft.)	SAC-4P-M12MR/0,15-PUR/M12FR TP	15 05 16 4
Angled M12 male connector to angled M12 female connector; Length: 0.3 m (0.98 ft.)	SAC-4P-M12MR/ 0,3-PUR/M12FR TP	15 05 17 7

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 4

Description	Order Designation	Order No.
Angled M12 male connector to angled M12 female connector; Length: 0.6 m (1.97 ft.)	SAC-4P-M12MR/ 0,6-PUR/M12FR TP	15 05 18 0
Angled M12 male connector to angled M12 female connector; Length: 1.5 m (4.92 ft.)	SAC-4P-M12MR/ 1,5-PUR/M12FR TP	15 05 19 3
Angled M12 male connector to angled M12 female connector; Length: 3.0 m (9.84 ft.)	SAC-4P-M12MR/ 3,0-PUR/M12FR TP	15 05 20 3

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 4

Description	Order Designation	Order No.
Labeling Material for Preassembled Loop 2 M12 Cables		
Marker bar, white, without color print 4 x 15 mm (0.157 x 0.591 in.)	PABA WH/15	10 13 15 1
Marker bar, yellow, without color print 4 x 15 mm (0.157 x 0.591 in.)	PABA YE/15	10 13 69 8
Marker bar, red, without color print 4 x 15 mm (0.157 x 0.591 in.)	PABA RD/15	10 13 94 4
Marker bar, blue, without color print 4 x 15 mm (0.157 x 0.591 in.)	PABA BU/15	08 00 72 1
Material for Free Assembly of Loop 2 M12 Cables		
Freely configurable M12 male connector	SACC-M12MS-4QLCON	16 40 22 3
Freely configurable M12 female connector	SACC-M12FS-4QLCON	16 40 21 0
Green Loop 2 M12 cable, 2 x 2 x 0.5 mm^2 (20 AWG), twisted pair, PVC	SAC-4P-...-PVC TP	16 96 38 7
Green Loop 2 M12 cable, 2 x 2 x 0.5 mm^2 (20 AWG), twisted pair, PUR	SAC-4P-..-PUR TP	15 06 85 9
Installation Material		
Hammer slot with M4 thread, for 10 mm (0.39 in.) slot	SACB-HMB 10-M4	16 95 46 9
Screw with M4 thread, for Loop 2 modules	SACB-M4X35	16 95 47 2
Screw with M4 thread for twin box	SACB-M4X45	16 95 48 5
Additional accessories for connecting M8 female connectors can be found in the Phoenix Contact PLUSCON catalog.		

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

7.5 Ordering Data for Documentation

Table 5

Description	Order Designation	Order No.
General introduction to the INTERBUS system	IBS SYS INTRO G4 UM E	27 45 21 1
CD-ROM with all INTERBUS data sheets	CD IBS DB ELDOC	27 45 60 6
CD-ROM with all INTERBUS manuals and data sheets	CD IBS UM/DB ELDOC	27 45 61 9

In addition, the complete INTERBUS documentation is also available on the Internet at http://www.phoenixcontact.com.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

A List of Devices of an INTERBUS Loop 2 System

The following tables contain a list of all current Loop 2 devices and their most important features and order numbers.

Short description

The short description gives a brief overview of the module.

The following can be specified:

– Number of inputs/outputs
– Nominal voltage
– Nominal current
– Any special features

ID code/ Length code

Each INTERBUS device has an ID code (identification code) that is used by the controller board to identify the device. The ID code specifies the type of device in the data telegram. In the tables, this code is indicated in decimal and hexadecimal notation.

The length code provides the number and type of representation of the process data (bit, nibble, byte, word) In the tables, this code is indicated in decimal and hexadecimal notation.

From the ID code and length code, the controller board generates a bus image which is used later for address assignment of the I/O data and for error detection during operation.

IN Addr.

Number of bytes that the module requires in the input address area

The input address area is an area in which the INTERBUS devices store their data for the control system.

OUT Addr.

Number of bytes that the module requires in the output address area

The control system stores the data that is to be transmitted to the INTERBUS devices in the output address area.

Reg. Length

Number of bytes in the INTERBUS ring (register length) for cycle time calculation

The register length indicates the number of bytes that a device occupies in the INTERBUS ring. This information is required to calculate the cycle time.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

A 1 Loop 2 Device List

Table A-1 Loop 2 device list

Order Designation	Order No.	Short description	ID Code dec/hex	Length Code dec/hex	IN Addr.	OUT Addr.	Reg. Length
Bus terminal module							
IBS L2 IP 24 BK-T	27 32 37 6	Remote bus devices 24 V supply voltage	04/04	00/00	0 bits	0 bits	0 bits
Supply							
IB L2 BOX 24 PWR IN 4/4 M12	27 32 39 2	4 IN, incl. sensor supply 24 V power supply	178/B2	65/41	4 bits	0 bits	4 bits
IB L2 BOX 24 PWR IN 4/4 M12-D	27 32 79 0	4 IN, double-assigned M12 incl. sensor supply 24 V power supply	178/B2	65/41	4 bits	0 bits	4 bits
Digital Inputs							
IB L2 BOX 24 DI 4/4 M12	27 31 98 2	4 IN, incl. sensor supply	178/B2	65/41	4 bits	0 bits	4 bits
IB L2 BOX 24 DI 4/4 M12-D	27 32 76 1	4 IN, double-assigned M12 incl. sensor supply	178/B2	65/41	4 bits	0 bits	4 bits
IB L2 BOX 24 DI 8/4 M12	27 31 99 5	8 IN, incl. sensor supply	178/B2	129/81	8 bits	0 bits	8 bits
Digital Outputs							
IB L2 BOX 24 DO 4/4 M12 2A	27 32 34 7	4 OUT, 24 V, 2 A	177/B1	65/41	0 bits	4 bits	4 bits
IB L2 BOX 24 DO 4/4 M12 2A-D	27 32 77 4	4 OUT, double-assigned M12 24 V, 2 A	177/B1	65/41	0 bits	4 bits	4 bits
Digital Inputs and Outputs							
IB L2 BOX 24 DIO 2/2/4 M12-2A	27 32 00 4	2 IN, incl. sensor supply 2 OUT, 24 V, 2 A	179/B3	65/41	4 bits	4 bits	4 bits
IB L2 BOX 24 DIO 2/2/4 M12 2A-D	27 32 78 7	2 IN, double-assigned M12 incl. sensor supply 2 OUT, 24 V, 2 A	179/B3	65/41	4 bits	4 bits	4 bits

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table A-1 Loop 2 device list (Contd.)

Order Designation	Order No.	Short description	ID Code dec/hex	Length Code dec/hex	IN Addr.	OUT Addr.	Reg. Length
Analog Inputs							
IB L2 BOX AI 2/2 M12	27 31 90 8	2 IN 0 mA through 20 mA 4 mA through 20 mA 0 V to 10 V 12 bits	115/73	02/02	4 bytes	4 bytes	4 bytes
IB L2 BOX TEMP 2/2 M12	27 31 92 4	2 TC IN, (J, K, ...) 2 RTD IN (PT 100 ...) 2 U IN (-20 mV through +150 mV -20 mV through +2400 mV) 2 R IN (0 Ω through 8 kΩ) 16 bits	115/73	02/02	4 bytes	4 bytes	4 bytes
For a complete list of the sensors, which can be used in connection with the module for temperature sensors (IB L2 BOX TEMP 2/2 M12), please refer to the module-specific data sheet							
Analog Outputs							
IB L2 BOX AO 1/2/I M12	27 31 93 7	1 OUT, 0 mA through 20 mA 4 mA through 20 mA 16 bits	113/71	01/01	0 bytes	2 bytes	2 bytes
IB L2 BOX AO 1/2/U M12	27 31 94 0	1 OUT, ±10 V, 12 bits	113/71	01/01	0 bytes	2 bytes	2 bytes
Motor Starter							
IB L2 IP 500 MLR 4-6A	27 32 38 9	500 V AC 4 motors	179/B3	129/81	1 bytes	1 bytes	1 bytes

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

A 2 S-Line Module Device List

Table A-2 INTERBUS S-Line devices

Order Designation	Order No.	Short description	ID Code dec/hex	Length Code dec/hex	IN Addr.	OUT Addr.	Reg. Length
Digital Inputs							
IB L2-M BOX 24 DI 8/8 M8	28 19 14 7	8 IN incl. sensor supply	178/B2	81/129	8 bits	0 bits	8 bits
Digital Outputs							
IB L2-M BOX 24 DO 8/8 M8	28 19 34 1	8 OUT, 24 V, 500 mA	177/B1	81/129	0 bits	8 bits	8 bits
IB L2-M BOX 24 DO 4/4 M8-2A	28 19 36 7	4 OUT, 24 V, 2 A Actuator supply via M12 connectors	177/B1	65/41	0 bits	4 bits	4 bits
Digital Inputs and Outputs							
IB L2-M BOX 24 DIO 4/4/8 M8	28 19 20 2	4 IN incl. sensor supply 4 OUT, 24 V, 500 mA	179/B3	65/41	4 bits	4 bits	4 bits
IB L2-M BOX 24 DIO 4/4 BT	28 19 27 3	4 illuminated pushbuttons	179/B3	65/41	4 bits	4 bits	4 bits

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

B Lists

B 1 List of Figures

Section 1

Figure 1-1: Example topology of the INTERBUS system 1-4
Figure 1-2: Schematic structure example of a Loop 2 system 1-12
Figure 1-3: Example topology with a twin box (branch line) 1-19
Figure 1-4: Example topology of a Loop 2 M12 ring system 1-20
Figure 1-5: Example topology of a Loop 2 system with safety circuit 1-22

Section 2

Figure 2-1: IBS L2 IP 24 BK-T bus terminal module 2-3
Figure 2-2: Loop 2 branch terminal IB IL 24 L2 2-6
Figure2-3: Digital modules 2-7
Figure2-4: Example of an analog Loop 2 module 2-9
Figure 2-5: INTERBUS Loop 2 motor starter IB L2 IP 500 MLR 4-6A 2-12
Figure 2-6: INTERBUSLoop 2 power module 2-14
Figure 2-7: Pin assignments of the twin box 2-18
Figure 2-8: Circuit diagram of the twin box 2-19
Figure 2-9: Short-circuit connector 2-20
Figure 2-10: Connections of the green Y connector 2-21
Figure 2-11: Pin assignment of the green Y connector 2-22
Figure 2-12: Pin assignments of the ADAP box 2-24
Figure 2-13: Connections of the yellow Y connector 2-26
Figure 2-14: Pin assignment of the yellow Y connector 2-27

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Figure 2-15: Connections of the black M8 Y connector 2-29
Figure 2-16: Pin assignment of the black M8 Y connector 2-29

Section 3

Figure 3-1: Structure of the IB L2 IP 24 BK-T bus terminal module 3-3
Figure 3-2: Structure of a Loop 2 input module 3-4
Figure 3-3: Structure of a Loop 2 output module 3-5
Figure 3-4: Structure of the Loop 2 motor starter 3-6
Figure 3-5: Structure of an S-Line module (example) 3-7
Figure 3-6: Dimensions of the bus terminal module 3-8
Figure 3-7: Dimensions of digital Loop 2 modules 3-9
Figure 3-8: Dimensions of the digital input module 3-10
Figure 3-9: Dimensions of analog Loop 2 modules 3-11
Figure 3-10: Dimensions of the Loop 2 motor starter 3-12
Figure 3-11: Dimensions of the S-Line modules with eight connections 3-13
Figure 3-12: Dimensions of the S-Line modules with four connections 3-14
Figure 3-13: Dimensions of the S-Line modules with four illuminated pushbuttons 3-14
Figure 3-14: Dimensions of the twin box 3-15
Figure 3-15: Labeling of I/O modules 3-16
Figure 3-16: Diagnostic indicators of the bus terminal module 3-18
Figure 3-17: Indicators of digital I/O modules 3-20
Figure 3-18: Indicators of the power module 3-21
Figure 3-19: Indicators for analog I/O modules 3-22
Figure 3-20: Indicators of the Loop 2 motor starter 3-23
Figure 3-21: Indicators of the S-Line modules (example) 3-25

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Section 4

Figure 4-1: Surge voltage protection measures 4-6
Figure 4-2: Relay coil with RC element 4-7
Figure 4-3: Recommended power concept 4-9
Figure 4-4: Voltage supply for a Loop 2 system with power module 4-10
Figure 4-5: Jumpered FE line on the digital output module 4-12
Figure 4-6: Loop 2 bus terminal module 4-15
Figure 4-7: Fitting the threaded joints 4-15
Figure 4-8: Assembling the components of the connector hood ..4-16
Figure 4-9: MINI-COMBICON pin assignment (installation remote bus) 4-18
Figure 4-10: MINI-COMBICON pin assignment (remote bus) 4-18
Figure 4-11: Strain relief and flexible ring 4-19
Figure 4-12: Placing the connector hoods 4-20
Figure 4-13: Connecting Loop 2 using the QUICKON connection method 4-21
Figure 4-14: Mounting QUICKON on the bus terminal module 4-23
Figure 4-15: Mounting QUICKON on I/O modules 4-24
Figure 4-16: Mounting QUICKON on motor starters 4-24
Figure 4-17: Assembling the connecting cable using the QUICKON connection method 4-26
Figure 4-18: Mounting the connecting cable 4-28
Figure 4-19: Mounting filler plugs 4-30
Figure 4-20: Connecting the shield plate for analog modules 4-33
Figure 4-21: Removing the terminal strip cover 4-36
Figure 4-22: Basic assembly of the cables in the terminal connection compartments 4-37
Figure 4-23: Example of connecting a motor and its PTC connection 4-39
Figure 4-24: Motor and PTC connection are connected 4-40

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Figure 4-25: Mounting the terminal strip cover 4-41
Figure 4-26: Pin assignment of M12 circular connectors 4-45
Figure 4-27: Position of the individual parts 4-45
Figure 4-28: Stripping off the cable 4-45
Figure 4-29: Actuator supply via unused actuator connector 4-46
Figure 4-30: Actuator supply via M8 Y connectors, jumpered 4-47
Figure 4-31: Independent actuator supply via M8 Y connectors 4-47
Figure 4-32: Loop 2 connection 4-49
Figure 4-33: Actuator supply connection 4-50
Figure 4-34: Measuring the Loop voltage (Loop 2 bus terminal module) 4-52
Figure 4-35: Measuring the Loop voltage (Inline with power module) 4-53
Figure 4-36: Pin assignment of the male and female connectors ..4-54

Section 5

Figure 5-1: Example structure 5-4
Figure 5-2: Separated Loop 2 supply voltage circuits 5-8
Figure 5-3: Measuring the voltages U1, U2, and the current I1 ...5-11
Figure 5-4: Measuring resistances R1 to R4 5-13

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

B 2 List of Tables

Section 1

Table 1-1: INTERBUS Loop 2 system specifications 1-16

Section 2

Table 2-1: Error messages for analog input modules 2-11
Table 2-2: Determining the voltage drop 2-17

Section 4

Table 4-1: Color assignment of the MINI-COMBICON connector 4-20
Table 4-2: Pin assignment of the splice ring 4-22
Table 4-3: Pin assignment of the splice ring 4-27
Table 4-4: Shield connection of analog sensors/actuators 4-32
Table 4-5: Preassembled Loop 2 M12 cables (PUR) 4-43
Table 4-6: Loop 2 M12 cable for free assembling 4-44

Section 5

Table 5-1: Error categories 5-14

Section 6

Table 6-1: Specifications for installation local bus cables (fixed) . 6-14
Table 6-2: Specifications for installation local bus cables (very flexible) 6-15
Table 6-3: Specifications for Loop 2 M12 cables 6-16
Table 6-4: Overview of remote bus cables 6-17
Table 6-5: Electric data of remote bus cables 6-19

Onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Table 6-6: Overview of installation bus cables....6-20
Table 6-7: Electric data of installation remote bus cables....6-22

Section 7

Table 1: 7-3
Table 2: 7-4
Table 3: 7-5
Table 4: 7-5

Appendix A

Table A-1: Loop 2 device list A-2
Table A-2: INTERBUS S-Line devices A-4

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

B 3 Explanation of Terms

Actuator

An actuator is a device that can influence the behavior of a process and thereby cause a change in the process variables. Actuators are, for example, lamps, switches, relays and so on.

Address

The address defines a certain memory location. Data can be written to this location or read when the memory location is accessed.

Addressing

The addressing is the way how addresses are assigned. INTERBUS uses user-defined addressing and automatic addressing.

Analog input

An analog input is an input to accept analog signals.

Analog output

An analog output is an output which makes analog signals available.

Automatic addressing

Automatic addressing is the assignment of process data (of devices) to the memory area of a control or computer system. With this addressing the process data is assigned automatically to the memory according to the physical location of the devices in the bus. When new devices are added later on, the process data has to be assigned again.

Automation terminal

Automation terminals are all modules of an INTERBUS Inline system with different functions.

Branch

An extension of the local bus is called branch. A branch is integrated through a branch terminal into the local bus and allows to connect a local bus of a different physical type. The branch is on the same device level as the local bus and cannot be switched. An example for this is the integration of INTERBUS Loop 2 into an INTERBUS Inline station.

Branch terminal

The branch terminal allows to connect a branch. It is not an INTERBUS device.

Bus

A bus is a system for the transmission of data, signals and, if necessary, supply voltages between various equipment (devices, automation stations) over a common wiring system. Speical conditions and protocols control the data to be transmitted for the connection of equipment and for the exchange of data. The term “bus” is used independent of the topology, e.g., line, ring, star.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Bus configuration

The bus configuration is the physically available sum of INTERBUS devices connected to the controller board. These also include the INTERBUS cables and other devices (e.g., interface converters optical fiber/two-wire, slip ring converter) that are required for data transmission.

Bus coupler

A bus coupler couples an I/O station to a bus system.

Bus cycle error

→ Single error

Bus device

→ INTERBUS device

Bus diagnostics

Bus diagnostics provide information on the status of the bus such as number of bus cycles or number, location and type of errors that occurred.

Bus error

A bus error is reported when the controller board cannot run valid data cycles after bus timeout (200 ms) has elapsed. Data transmission on the bus is stopped. There are two types of bus errors: general bus errors (BUS), which cannot be located exactly and bus errors which can be located:

- RBUS for a remote bus error
- LBUS for a local bus error
- OUT1 for errors at the outgoing interface
- OUT2 for errors at the branching interface
- DEV for an error on a device

Bus segment

A bus segment consists of a remote bus device and the I/O modules connected to it. The preceding cable is also part of the segment.

Segment number

→ Bus segment number

Bus segment number

The bus segment number is the high byte of the logical device number.

Bus terminal module

The first step in setting up a modular I/O station is to connect the bus terminal module to the INTERBUS remote bus cable. The I/O modules may be installed branching off from these bus terminal modules to create a local bus (or installation local bus). A remote bus branch, local bus branch, or installation remote bus branch can be connected to this bus terminal module via an additional interface. Bus terminal modules amplify signals (repeater function), divide the system into segments, and provide the means

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

for switching off single branches during operation. In addition, the bus terminal modules supply the module electronics of the connected I/O modules with communications power.

Bus topology → Topology

Communications power Communications power UL supplies the module electronics of the device with power. It is generated from the supply voltage.

Controller board The host controller board connects programmable logic controllers (PLCs) or computer systems (PCs, VMEbus systems etc.) to the INTERBUS system. The controller board takes over the master function and controls the data traffic in the INTERBUS system, independent of the control or computer system in which it is installed.

CRC → Cyclic redundancy check

CRC error Data transmission error which was detected by means of a CRC. This error can be produced by every INTERBUS device after the CRC check word has been generated.

Cycle time The cycle time is the time that the INTERBUS system needs to read all data from the connected devices and to write data to all connected devices.

Cyclic redundancy check The cyclic redundancy check is a test method for data integrity in which a data block is divided by a standardized polynomial and the rest of the division is appended as a CRC check word to the user data block to be transmitted.The cyclic redundancy check is a test method for data integrity in which a data block is divided by a standardized polynomial and the rest of the division is appended as a CRC check word to the user data block to be transmitted.

Device → INTERBUS device

Device code The device code is a data word to identify the characteristics of an INTERBUS device. It consists of the length code (high byte) and ID code (low byte).

Device numbers With INTERBUS, there are logical device numbers and physical device numbers.

Diagnostics → Bus diagnostics

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Direct mounting

In the INTERBUS system the modules can be installed using rail mounting or direct mounting. Direct mounting means that the modules are fastened with screws to grounded mounting angles or mounting plates.

Electrical isolation

Electrical isolation means that the circuits of an electrical device are galvanically separated from each other.

Extended installation remote bus

The extended installation remote bus is an installation remote bus with a current carrying capacity of 16 A instead of the normal 4.5 A.

FC

→ Abbreviation for field controller

Field controller

The field controller (FC) is used to control an INTERBUS network. Unlike the controller board, the FC is not connected to a control system, but operates autonomously. Programming takes place with PC WORX in accordance with IEC 61131.

Fieldbus

A fieldbus is a digital communication network used to connect process instrumentation and control systems.

Function module

A function module is a module with certain functions (e.g., counter module, V.24 module, incremental encoder module, etc.).

Functional earth ground

A low impedance path between electrical circuits and earth for non-safety purposes such as noise immunity improvement.

Host

Host is the denomination for the control or computer system into which the controller board is integrated.

I/O device

An I/O device is an INTERBUS device that transmits IN process data and/or OUT process data.

I/O module

I/O modules connect INTERBUS to the sensors and actuators.

ID code

Each INTERBUS device has an ID code (identification code) that is used by the controller board to identify the device. The ID code specifies the type of device in the data telegram. It indicates whether it is an analog or digital module or a bus terminal module; whether it is an input or output module; and whether it is a PCP device or a master. It uses the low byte of the device code.

online components.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

ID cycle

The controller board uses the ID cycle to determine the connected bus configuration. The following information is read in: number and order of modules, ID code and length code.

IN data

→ Input data

IN process data

The IN process data is the part of the input data which is cyclically transmitted from the INTERBUS devices to the INTERBUS controller board.

Incoming interface

Data from the previous device is received via the incoming interface. Data which is received by next device via an outgoing interface is sent back to the bus master via this incoming interface.

Input address area

The input address area is an area in which the INTERBUS devices store their data for the control system.

Input data

Input data is data that is transmitted from an INTERBUS device to an application program. Within the INTERBUS, there are input process data and input parameter data.

Installation remote bus

The installation remote bus is a variant of the remote bus. The installation remote bus carries communications power and supply voltage for the module electronics of the I/O modules and the sensors in the same bus cable. Power is supplied through a bus terminal module into the installation remote bus. In terms of the topology it is a remote bus branch and can be used to set up distributed substations with a direct connection of the sensors and actuators. (See also extended installation remote bus)

Installation remote bus device

An installation remote bus device is an INTERBUS device whose remote bus interface may provide an additional voltage for the supply of the module electronics and sensors.

Installation system

The INTERBUS installation system consists of standardized functions, uniform interfaces, and easy connections. This system consists of INTERBUS Inline and INTERBUS Loop 2.

INTERBUS

INTERBUS is a fieldbus standardized according to IEC 61158 for the serial transmission of data on the sensor/actuator level.

INTERBUS device

An INTERBUS device is part of an INTERBUS module and participates in the data exchange via the INTERBUS system. Each INTERBUS device has only one protocol chip. The devices are identified through the device code. There are also INTERBUS modules that include several devices.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

INTERBUS Inline

The terminals of the INTERBUS Inline product family create a modular automation system that is integrated into the INTERBUS system. Inline automation terminals can be easily joined together, without the use of any tools, to create function units, that meet the required automation tasks. INTERBUS Inline can be used either in a central control cabinet or a remote control box.

INTERBUS Loop

INTERBUS Loop can be used to network sensors and actuators that are distributed at machines or in systems. Individual I/O devices with corresponding module electronics can also be connected to INTERBUS Loop. INTERBUS Loop is connected to the remote bus by using a bus terminal module. The terminal module converts the remote bus signal to an INTERBUS Loop signal. The cable carries the Loop signal and the communications power to the Loop I/O modules. The INTERBUS Loop is a ring in which the first device is connected to the terminal module. The Loop cable is returned from the last device to the terminal module. INTERBUS Loop can only be used with controller boards with a firmware of revision 4.15 or later (see also INTERBUS Loop 2).

INTERBUS Loop 2

INTERBUS Loop 2 is a further development of INTERBUS Loop. It features extended technical parameters and extensive diagnostics.
INTERBUS Loop 2 can be used to network sensors and actuators which are distributed at machines or in systems. Individual I/O devices with corresponding module electronics can also be connected to INTERBUS Loop 2. INTERBUS Loop 2 is connected to the remote bus by using a bus terminal module or to an Inline station by using a branch terminal. The bus terminal module/branch terminal converts the remote bus signal to an INTERBUS Loop 2 signal. The cable carries the Loop signal and the communications power to the Loop I/O modules. INTERBUS Loop 2 is a ring in which the first device is connected to the bus terminal module/ branch terminal. The Loop 2 cable is returned from the last device to the bus terminal module. INTERBUS Loop 2 can only be used with controller boards with a firmware of revision 4.4x or later (see also INTERBUS Loop).

INTERBUS-S-Line

INTERBUS-S-Line is based on the functionality of INTERBUS Loop 2. It was developed in particular for the use on small and medium-sized machines. Pre-assembled and tested cables with M12 circular connectors are used as S-Line bus cables. Sensors and actuators are connected vie M8 connectors to the input and output modules.

Length code

The length code provides the number and type of representation of the process data (bit, nibble, byte, word) by using the high byte of the device code.

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Local bus	→ Peripheral bus (connects flat-pack I/O modules)
Local bus branch	A local bus branch can be started with a special bus terminal module which, apart from the standard interfaces, has an additional local bus interface. A local bus branch cannot have further sub-branches.
Local bus device	A local bus device operates as a slave on a local bus.
Local bus error	The local bus error is a bus error that occurs in a local bus.
Logical addressing	→ User-defined addressing
Logical device number	Each INTERBUS device of a configuration frame is assigned a unique device list. This device number is specified in the form "Segment.Position" (Seg.Pos). The logical device number 0.0 is reserved for the controller board. The numbers "1.0" to "254.254" can be assigned. Each remote bus device receives the position number 0. Each local bus device receives the segment number of the associated remote bus device.
Loop-2-M12	→ INTERBUS-S-Line
Master	The master controls the data transfer on the network and initiates the media access of the slaves by sending messages. The master constitutes the interface to the control system.
OUT process data	The OUT process data is the part of the output data which is cyclically transmitted from the INTERBUS controller board to the INTERBUS devices.
Outgoing interface	The outgoing interface is the INTERBUS interface of a device where the data leaves the device on the same device level (Display: OUT1).
Output address area	The output address area is an area in which the application program stores data which is to be transmitted to the INTERBUS devices.
OUT data	→ Output data
Output data	Output data is data which the INTERBUS controller board transmits to the INTERBUS devices.
PCP	The peripherals communication protocol (PCP) belongs to the INTERBUS protocol and controls the transmission of parameter data. Special PCP services are available for this purpose.

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Peripheral fault — PF (peripheral fault) indicates an error in the periphery of an INTERBUS device.

Peripherals communication protocol — → PCP

PF — → Peripheral fault

Physical addressing — → Automatic addressing

Physical device number — The physical device number identifies the order of the devices determined by the bus system structure. It is assigned from 1 to 512 in an ascending order without gaps.

Position number — The position number is the low byte of the logical device number (see also logical device number).

Power terminal — The power terminal is a supply terminal. It supplies the main voltage to the station-internal potential router. In addition to the main voltage, the segment voltage may be supplied or tapped off from the main voltage. Several power terminals can be used in an Inline station. It realizes the electrical isolation between the different current circuits and permits areas with different voltages within the station (e.g., 24 V DC and 230 V AC).

Process data length — Length of the data registers on an INTERBUS device in bytes (without PCP channel).

RB — → Remote bus

Remote bus — The remote bus interconnects remote bus devices and connects them to the controller board. All devices that are connected to the remote bus must be supplied with external power (see also installation local bus.)

Remote bus branch — A remote bus branch can be started with a special bus terminal module which, apart from the standard interfaces, has an additional remote bus interface. A remote bus branch may have further branches. Up to 16 bus levels (branches) are permitted.

Remote bus cable — - Optical fiber in different types

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Remote bus device

Remote bus devices are INTERBUS devices with a remote bus interface. These include bus terminal modules, certain I/O modules or a combination of both, as well as devices such as frequency inverters from third-party manufacturers. Remote bus devices always have an external power supply.

Remote field controller

The Remote Field Controller (RFC) opens an INTERBUS system in a higher-level network (e.g., Ethernet or INTERBUS). Programming takes place with PC WORX in accordance with IEC 61131.

RFC

→ Remote Field Controller

Segment

→ Bus segment

Single error

A single error is an error (for instance a CRC error) that occurs within a bus cycle. The data of this cycle is completely rejected. A single error does not generate an error message and does not cause a bus downtime.

Slave

A slave is a device in the network which can only participate in the data exchange after it has been addressed by the master.

Summation frame

The summation frame is a transmission protocol in which all physical devices are treated as if they were one logical device. All process data is transmitted simultaneously to all devices during a cycle. On the basis of the location of the information in the summation frame, each device can accept the data that is determined for it.

Topology

In an INTERBUS system the topology is a ring structure.

Tree structure

The tree structure, which is characterized by several branches is an important development of the linear structure. It can be used to optimally adapt a network to the spatial requirements of a building.

User-defined addressing

User-defined addressing is an assignment of the process data (of devices) to the memory area of a control or computer system. With this addressing the assignment of the process data to the memory area is freely assigned by the user. The assignment of the process data is independent of the physical location of the devices in the bus. This makes it possible to insert further devices to the bus at a later stage without shifting the addresses of the existing devices.(INTERBUS Generation 4).

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

B 4 Index

A

Accessories 7-10
ADAP box 2-24
Analog I/O modules
- Connections 2-9
- Diagnostic and status indicators 2-10
- Grounding 2-10
- Protection 2-9
- Voltage supply 2-11

B

Bus connection 1-15, 1-18
Bus segment 1-8
Bus terminal module 1-5, 2-3
- Connections 2-4
- Diagnostic LEDs 2-5
- Grounding 2-5, 4-13
- Voltage supply 2-4, 4-8

C

Cable specification
- Installation remote bus 6-20
- Loop 2 M12 cable 6-16
- Remote bus cables 6-17

Connecting I/O devices
- I/O modules 4-54
- Motor starter 4-36

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Controller board 1-4

D

Diagnostic and status indicators 3-17
Diagnostics
  Extended 2-11
Digital I/O modules
  Connections 2-8
  Diagnostic and status indicators 2-8
  Grounding 2-8
  Protection 2-8
  Voltage supply 2-8

E

Error
  Diagnostics 3-17

G

Green Y connector 2-21
Ground loops 4-34
Grounding
  Analog I/O modules 2-10
  Bus terminal module 2-5, 4-13
  Digital I/O modules 2-8
  Loop 2 4-14
  Power module 2-14

I

I/O modules 1-8
  Connecting I/O devices 4-54
Installation local bus 1-6, 1-7
Installation remote bus 1-6
  Selecting cables 6-20

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

INTERBUS Loop 2 1-7
Module versions 1-14, 1-18
Positioning 1-15, 1-18
Product description 1-14
INTERBUS S-Line
Configuration 2-17
Diagnostics 2-17
Digital modules 2-15
Example topologies 1-19
Loop 2 M12 cable 4-43
Mounting 4-42
Product description 1-18
Product family 2-15
System description 1-17
Technical data 6-11
INTERBUS System 1-3
Internet 1-7

L

Local bus 1-6
Loop 2 M12 cable
Assembling 4-43
Cable specification 6-16
Loop 2 M12 see INTERBUS S-Line

M

M8 Y connector 2-29
Motor starter 2-12
Connecting the power periphery 4-36
Diagnostic and status indicators 3-23

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

Mounting 1-15, 1-18, 4-13

O

Ordering Data
- Documentation 7-10
- INTERBUS S-Line 7-5
- Loop 2 accessories 7-4
- Loop 2 modules 7-3

P

Parameterization
- Terminals for analog signals 2-10

Power module 2-14, 4-10
- Connections 2-14
- Diagnostic and status indicators .. 2-14, 2-16
- Grounding 2-14
- Protection 2-14

Protection 2-5

R

Remote bus 1-6
- see Remote bus
- Selecting cables 6-17

Remote bus branch 1-8

S

Safety circuit 1-17, 1-22

Shielding
- Modules for analog signals 2-10

System Data
- INTERBUS 6-3
- INTERBUS Inline 6-6
- INTERBUS Loop 2 6-5

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

System requirements 1-14, 1-18

T

Technical data
INTERBUS Loop 2 6-7
INTERBUS S-Line 6-11
Total sensor current 4-10
Tree structure 1-3
Twin box 2-18

V

Voltage supply 2-8, 2-11
Bus terminal modules 2-4, 4-8

Y

Y connector
Green 2-21
M8 2-29
Yellow 2-26
Yellow Y connector 2-26

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

faxreply_10pt_ms.fm Seite 18 Dienstag, 19. Juli 2005 10:38 10

We Are Interested in Your Opinion!

We would like to hear your comments and suggestions concerning this document.

We review and consider all comments for inclusion in future documentation.

Please fill out the form on the following page and fax it to us or send your comments, suggestions for improvement, etc. to the following address:

PHOENIX CONTACT GmbH & Co. KG
Documentation Services
32823 Blomberg
GERMANY

Phone +49 - (0) 52 35 - 3-00
Telefax +49 - (0) 52 35 - 3-4 20 21
E-Mail tecdoc@phoenixcontact.com

onlinecomponents.com

onlinecomponents.com
THE ONLINE DISTRIBUTOR OF ELECTRONIC COMPONENTS

faxreply_10pt_ms.fm Seite 19 Dienstag, 19. Juli 2005 10:38 10

FAX Reply

PHOENIX CONTACT GmbH & Co. KG
Documentation Services

Date: _____

Fax No: +49 - (0) 52 35 - 3-4 20 21

From:

Company:		Name:	
		Department:	
Address:		Job function:	
City, ZIP code:		Phone:	
Country:		Fax:	

Document:

Designation: _____ Revision: _____ Order No.: _____

My Opinion on the Document

Form	**Yes**	**In part**	**No**
Is the table of contents clearly arranged?	☐	☐	☐
Are the figures/diagrams easy to understand/helpful?	☐	☐	☐
Are the written explanations of the figures adequate?	☐	☐	☐
Does the quality of the figures meet your expectations/needs?	☐	☐	☐
Does the layout of the document allow you to find information easily?	☐	☐	☐
Contents	**Yes**	**In part**	**No**
Is the phraseology/terminology easy to understand?	☐	☐	☐
Are the index entries easy to understand/helpful?	☐	☐	☐
Are the examples practice-oriented?	☐	☐	☐
Is the document easy to handle?	☐	☐	☐
Is any important information missing? If yes, what?	☐	☐	☐

Other Comments:

_____

_____

onlinecomponents.com